SEPTEMBER 1943

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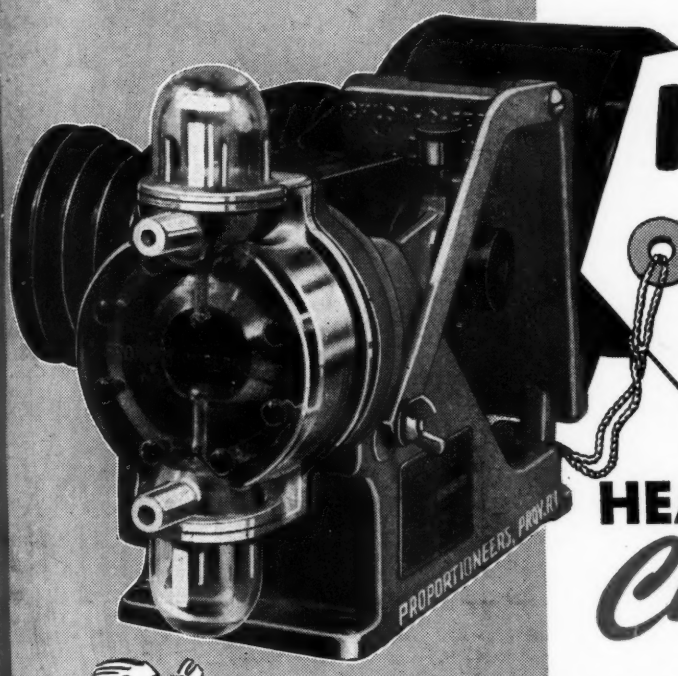

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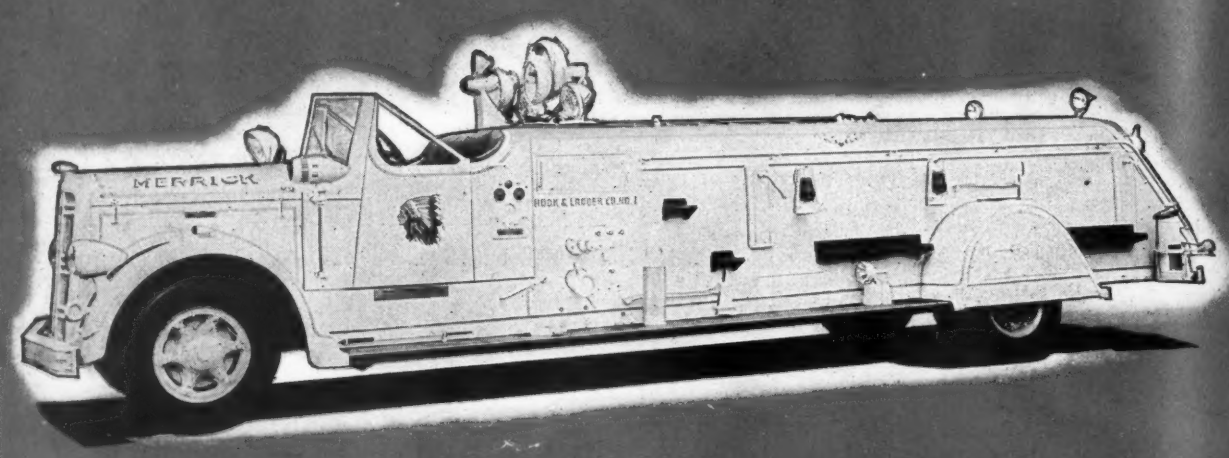

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Vol. 74 No. 9

A. PRESCOTT FOLWELL, Editor

SEPTEMBER CONTENTS

HIGHWAYS

Building a Soil-Cement Road in Kenosha County. *By Harold H. Herzog* 14
Precast Concrete Curb in Lee, Mass. *By Louis A. Airoldi* 26
A Concrete Road 1¼ Inches Thick 28
Maintenance of Public Works Equipment. *By W. E. Rosengarten* 42
Decreasing Practice of Assessing for Street Paving 44
Frost Heaving in Road Subgrades 44
Vermont Supreme Court Decision Upholds Billboard Law 45
Road Markings for Blackout Conditions 47

SEWERAGE AND SANITATION

Englewood's Sewage Pumping Station. *By Russell Hartley* 11
The Water Chestnut and Malaria Control 13
Typhoid Fever in Maryland 13
Effect of Discontinuance of Chlorination of Sewage Plant Effluent 18
Two-Step Lime Addition for Sewage Coagulation and pH Control *By Willem Rudolfs and G. B. Nickol* 30
Activated Sludge Study at Ann Arbor, Mich. 48
The Sewerage Digest 50

WATER SUPPLY AND PURIFICATION

Some Aspects of Driven Well Construction. *By H. R. Shipman* 16
Policing Municipal Water Supply Sources 18
Foundation Grouting of a Reservoir. *By Harry C. McCrea* 23
A 160 mgd Pumping Plant Installed in Eight Weeks 40
A Covered Reservoir Without Reinforcement 40
Coliform Organisms in Frogs and Tadpoles 46
Responsibility for Leaking Water Mains 46
The Waterworks Digest 55

THE WAR EMERGENCY 7

Order U-1-d Simplified for Waterworks
Steel Rails No Longer Needed
Conservation of Personnel
Garbage Baskets Available
"Blueprint Now"

GENERAL

Precision in Batching Concrete 21
Postwar Expenditures Planned by Cities 38
Compensation for Unforeseen Conditions 40
Do You Get It, or Don't You 43
Community Forests for Revenue and Recreation 49
Keeping Up With New Equipment 60
Reader's Service Department 65

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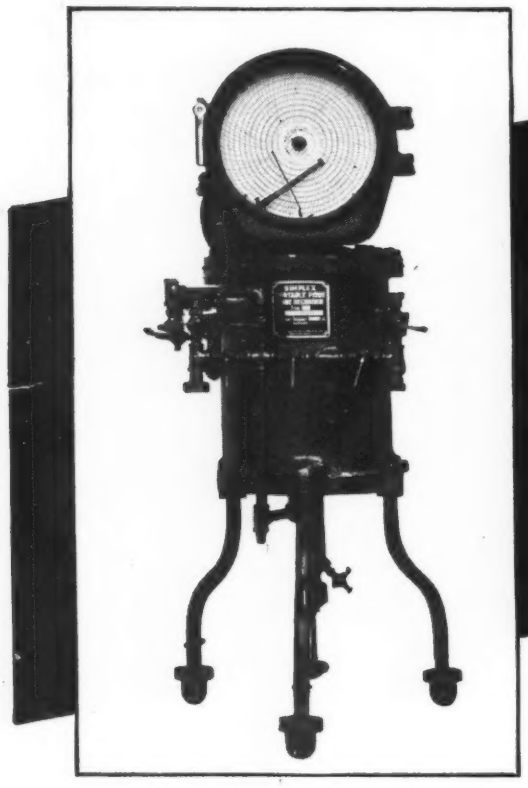

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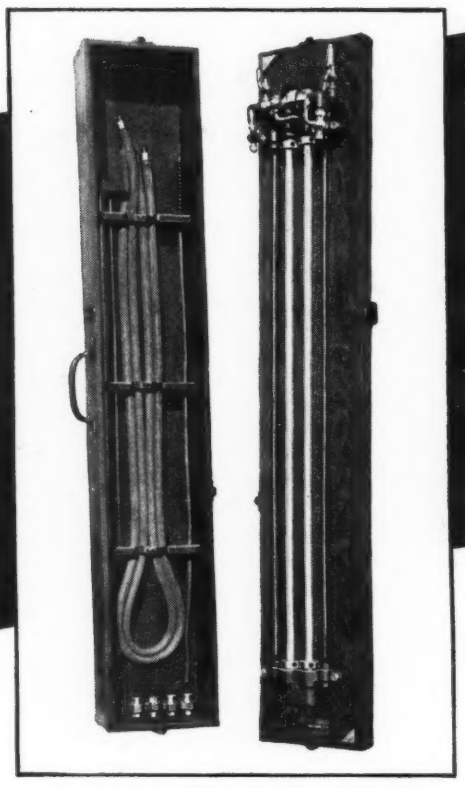

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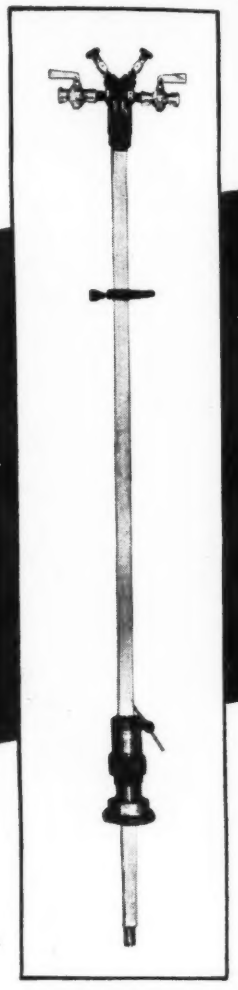

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When you need special information—consult the classified READER'S SERVICE DEPT., *pages 65-67*

THE WAR EMERGENCY

Order U-1-d Simplified for Water Works

Until August 24 applications for extensions of utility services, no matter how small, had to obtain permission through filing a WPB-2774 application, which involved a vast amount of paper work. On that date a new order, U-1-f, was issued which permits utilities to grant extensions costing not more than $200 without filing applications with Washington when the restrictions of the order are met. This implies no relaxation of the restrictions, but eliminates processing of eight to ten thousand applications a month, most of which have been granted as a matter of necessity. This new order does not apply to applicants for utilities other than water unless they are located in a critical housing area.

P-141 And Sewerage Systems

Under a revision of Preference Rating Order P-141, made in July, the order now covers only "public sanitary sewerage systems operated separately or combined with a storm sewerage system." Other sanitation services are covered by CMP Regulation 5A. This latter regulation is expressly superseded by P-141 insofar as sanitary and combined sewerage systems are concerned, and the ratings and symbol assigned to CMP Regulation 5A may no longer be used for such systems.

Steel Rails No Longer Needed

The War Production Board has cancelled contracts or negotiations for rail removal and repaving projects with approximately 150 cities, according to recent word from the National Institute of Municipal Law Officers, says the American Public Works Association. Of the above number, all but ten cases have been settled to the satisfaction of the cities, it is reported.

In a number of instances, legal difficulties have arisen over the question of the existence of a real contract when neither WPB nor War Materials, Inc., had actually signed the papers, although the cities had signed them and delivered them to Washington. Consideration is being given by a number of cities, in light of this experience, to the requirements in the future that federal agencies sign contractual papers at the same time as the city contracting officers.

It is reported that the scrap situation at this time has improved to the point where it is not necessary to continue the street car rail removal projects.

Garbage Baskets Available

Permission to manufacture a limited number of steel baskets for garbage collection systems requiring such baskets for transporting garbage from house to truck was granted by the War Production Board on August 9. These baskets will be available only to cities with this type of garbage collection system. Cities having such systems should notify WPB's Government Division of their requirements prior to September 15 and should give the following information in their notifications: (1) description of the system in sufficient detail to make clear that baskets of this type are an essential part of the system; (2) number of baskets now in use; (3) their condition; (4) approximate life of baskets in use; (5) number of baskets in inventory; (6) number of baskets needed during the next twelve months.

Copper and "Saran" Service Pipe

On August 3 OPA announced that uniform dollars and cents maximum prices and discounts for "Saran" tubing had been readjusted, there being a slight reduction on some items. This is in recognition that the manufacture and distribution of this tubing are now getting under way on a commercial scale.

"Blueprint Now"

That is the slogan of the committee on Water and Sewage Works Development, organized and financed by the American and New England Water Works Associations, the Federation of Sewage Works Associations and the Water and Sewage Works Manufacturers Association, of which Abel Wolman is Chairman and Harry E. Jordan, 500 Fifth Ave., New York 18, N. Y. is Secretary. E. L. Filby (of Black & Veatch, Kansas City) is Field Director.

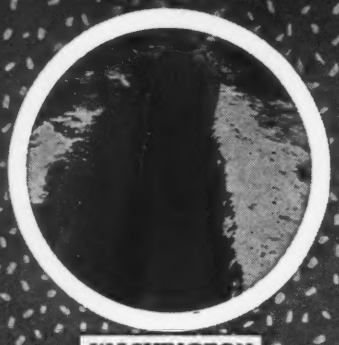
The committee plans to stimulate the following municipal activities:

1. An appraisal of the needs for water and sewage works improvement or construction.
2. The development of orderly programs for meeting these needs in the order related to their value to the city or the region.
3. The preparation of detailed plans and specifications for the needs of first importance as soon as arrangements can be made.
4. Consideration of, and development of methods for funding the necessary construction.
5. Reappraisal of authority under which the contemplated projects can be carried on as well as the legal basis for funding such operations. (Promotion of legislation whenever needed.)
6. Definite scheduling of the construction program. (Immediate purchase of land and rights of way, if part of the projects.)

The committee believes that: "Federal aid is not essential to the planning or building of water and sewage works. The danger in the discussions now going on about this bill or that bill which is intended to provide funds for planning or reconstruction, is that there is great doubt that any bill of this nature will become law before the middle of 1944. Why wait for uncertain legislation to draw plans for water works or sewage improvements—especially since the going-concern ability of the water works and the revenue bond features of sewage systems make it possible to fund these projects locally? There is a dangerous carryover from the post-depression period which the joint committee believes should be discouraged."

The committee contemplates the organization of state committees, the members of which might include the State Sanitary Engineer, State Planning Engineer or equivalent, State Sanitary Water Board Engineer, State Water Engineer; local officials such as water

(Continued on page 43)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If you were to cut a cross-section out of the water a sewer lines running through the nation's communities, y would find many, many more J-M Transite Pipe installatio than we have room for here.

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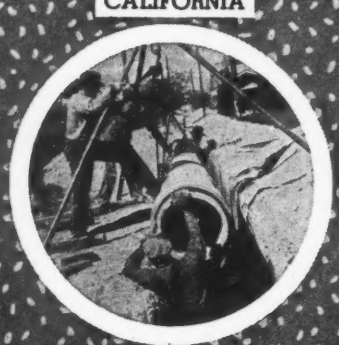
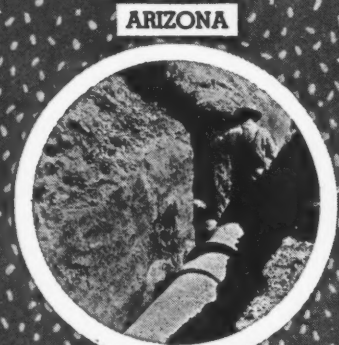

ARIZONA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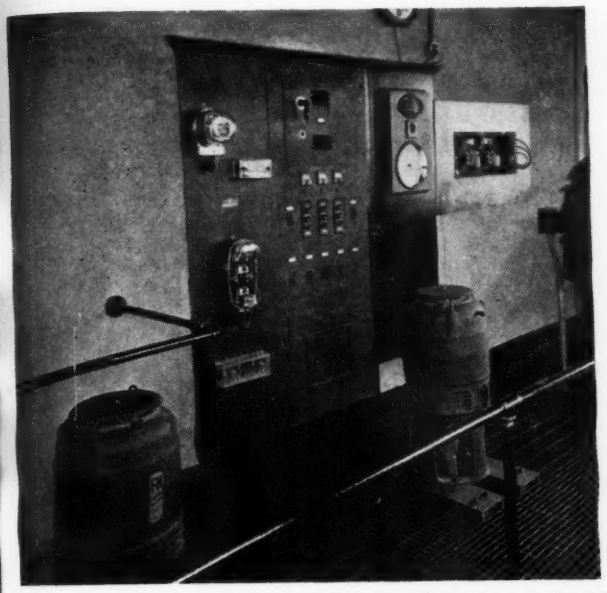
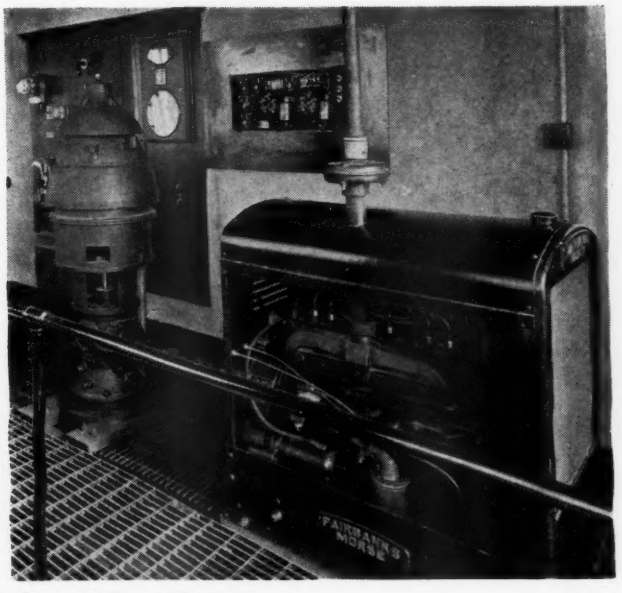
Vol. 74. No. 9





Motors and power unit for driving the vertical centrifugal pumps.

Englewood's Sewage Pumping Station

By RUSSELL HARTLEY

City Engineer, Englewood, N. J.

Lifts sewage of twenty thousand population twenty-five feet to outfall sewer, using electric motors and a 6-cylinder stand-by unit. Automatic operation and control and recording meter.

THE City of Englewood, N. J., acquired the problem of satisfactory disposal of its sewage when it purchased the privately owned sanitary sewer system of the Englewood Sewerage Co. This comprised some 60 miles of sewers of various sizes and conditions and over 4,400 active connections serving a population of about 19,000 people.

The general drainage is toward the southwest corner of the city, and all the sewers had been planned to discharge by gravity into Overpeck creek, a tributary of the Hackensack river, at about mean tide level (passing meantime through a septic tank), thus avoiding pumping. This resulted in very flat grades for the sewers, especially in an area of the city about two miles long by a half-mile wide bordering the tidal marsh. Also the sewers here were near the surface and interfered with storm drainage pipes and channels.

The several communities in this area have been using the tidal marshes, which they border in contiguous succession, for sludge digestion, which has produced a condition that the State Board of Health decided must be changed, and it ordered them to build adequate sewage treatment plants. Joint treatment works seemed a logical solution. A joint trunk sewer could be built through all of them along the edge of the marsh land leading to such joint plant. But it has been difficult to get the communities together on such a project. If Englewood built its own plant, it would be located in the southwest corner of the city; and if the joint project went through, its sewage would enter the trunk sewer there. Therefore the city engineer was instructed to plan an improved system to conduct the sewage to this point. This involved providing new trunk sewers with better grades, and a pumping station to which all the sewage would flow. Sewers so planned would reach the pumping station about 7 ft. deeper than the existing ones, and be below the natural streams and storm sewers.

These plans were made and work on this project was started while WPA aid was available, and the pumping station and 1600 ft. of the trunk sewer have been built to date; the city supplying all engineering

Russell Hartley and map of Englewood.

and skilled mechanical work, and extra labor when WPA could not adequately man the work. (Due to the tapering off of the WPA, it could not always provide the type of men needed.) The foundation of the pumping station is 16 ft. below mean sea level, in a nice gooey clay that took plenty of hard work on everybody's part to excavate.

The pumping plant is designed to handle the flow from an ultimate population of 30,000; the present installation now in operation is for a population of 20,000. The sewage enters the pumping station through a transition section from the 24″ reinforced concrete trunk sewer and is screened by a 48″ wide "Tritor" screen with bars set at 1″ intervals, equipped with baffles, a weir and a grit sump 48″ deep. The screen-cleaning bucket discharges the screenings into a chute above the main pump room floor, from which they are removed by buggies and buried on the property. The entire screening equipment is located in one corner of the pumping station which is completely separated from the pumping equipment by partition walls and a steel door.

The wet well is a truncated prism with two sides sloping 45° to a narrow bottom and the other two sides nearly vertical, the pump suctions being spaced along the bottom at intervals of 5 ft. All the concrete surfaces that are wet by sewage, including the approach sewer pipe, have been painted with Wailes Dove-Hermiston "Bitumastic" No. 50.

The cast iron pipe in the building is all U. S. Pipe & Foundry Co. flanged pipe and specials. The discharge line is bell and spigot Super De Lavaud pipe.

Each pump has a Nordstrom plug-type valve on each side provided for gear operation from a higher level. There is also a Crane check valve on the discharge side of each pump. All valves and the header pipe are set in a horizontal position.

The present pumping equipment consists of three Fairbanks Morse non-clog vertical centrifugal pumps, capable of passing 3″ spheres. The motors are set above the floor, about 20 feet above the base of the pumps. This floor is at least 18″ above the highest recorded tide level in the area. The motors are connected to the pumps with Watson Spicer shafting with two intermediate bearings, each provided with a strong structural steel support. The largest pump is provided with an auxiliary drive by means of a Johnson right-angle gear and a Fairbanks Morse 6-cylinder, industrial power unit capable of running the pump at a greater speed than the electric motor. The pumps were selected to deliver approximately 500, 700 and 1200 gallons per minute against a 25 foot head with 5 H.P., 7½ H.P. and 15 H.P. motors respectively. The pump casing and shafting selected will permit a change of impeller and motor so that the capacity of any pump may be changed. An additional suction pipe was installed to the wet well to permit the addition of a fourth pump. The largest pump has an auxiliary suction provided, by means of which the pump room may be drained in case of necessity, and in addition a 1 H.P. automatic electric sump pump handles seepage from the pumps. (The concrete building has been dry from the start. No waterproofing was used but there was a rigid control of the concrete mix and the joints in the poured walls.)

The electric control of the pumps is arranged on a panel board of General Electric manufacture set in the wall parallel to the pumps and over the wet well wall. One section contains the metering equipment of the Public Service Electric Co. The entrance service is 4-wire, 208-110 volt, 3 phase, 60 cycle current. There is a master switch of the air circuit breaker type on the top of the panel board, and each pump motor has its individual air circuit breaker, a stop-and-start button for hand control, and also automatic control. There is also a time meter for recording pump operation. The sewage screen has a circuit breaker on this panel board, and is further controlled by switch and push buttons alongside of the screen in the screen room. There are two spare circuits for additional equipment and a Trumbull circuit breaker lighting panel on the board.

Automatic pump operation is provided by a RotoTrol sump control, manufactured by the Water Level Controls Co., operating from the wet well, arranged for 5 sequences of operation with water level rising and 5 with water level falling. This gadget intrigues visitors to the plant more than anything else when they realize that a little mercury moving in a tube is starting and stopping the big pumps. It is a very delicate instrument and requires extreme care in setting but it is very reliable once it has been adjusted. The pumps switch on and off as pressure in the tube changes by reason of height of sewage in the wet well.

The flow is recorded by a Simplex Valve and Meter Co. flow meter, the venturi tube of which is provided with a by-pass and valve arrangement so that it may be taken out of service, if necessary for replacement with a larger meter, without stopping operation of the pumping station. The recording device is set in the wall alongside of the electric control panel and the RotoTrol sump control. The recording meter has a capacity equal to that of the pumps, 3.5 mgd, which it was felt provided sufficient capacity for normal flow from 19,000 people. The recording device has an indicator showing the total number of gallons pumped and a chart providing a record of the pump operation and rate of flow. The meter tube is set horizontal on an intermediate floor between the pumps and the

operating floor, below the level of the discharge of the sewage so that the venturi tube is always under pressure of sewage regardless of pump operation.

The city is getting an accurate record of the flow in its sewers from its present population and these data will be used to prepare designs for the treatment plant to be built after the war is ended.

The building is heated with a Weil McClain steam boilet set on a platform at the pump level in the dry well. Radiation in the dry well is installed just above the level of the boiler and causes a continuous upward flow of moist air. No steam piping is covered. This arrangement has been very successful in keeping condensation on the pipes and walls to a minimum. The part of the building above ground floor level is well equipped with windows and these, operated in conjunction with the heat in the winter, carry off the condensation by the updraft caused by the radiation. In summer they usually create enough natural draft to carry off all moisture. It is about 25 feet from the window sill to the bottom of the pump pit. This is an open well with only a partial grating floor resting on the steel beams that support the pump shaft bearings.

The plans and specifications for this project were prepared by the writer's office. The entire construction was handled as a force account project.

The engineer's office in Englewood, in addition to normal engineering duties, is in charge of all public works, including the sewer division.

On taking over the system the city reduced the sewer service charges ten percent below the private company's rate schedule. The income from the sewer rates is supposed to:

1—Amortize the bonds issued for the purchase of the sewer system.

2—Provide funds for all capital construction, which will include a complete disposal plant as soon as the war is over.

3—Provide funds for all main extensions.

4—Provide funds for operation of the present system, the future disposal plant and the finance office.

The sewer revenues are kept separate from other city revenues and are used for sewer purposes only. At present we are investing in war bonds, to be used for the disposal plant we expect to build after the war, the surplus after paying to the general city treasury a sum equivalent to the taxes formerly collected from the sewer company.

View of pumps from floor above.

Flow recorder and pump control.

The Water Chestnut and Malaria Control

In August 1942 the Maryland State Dept. of Health and the U. S. Public Health Service jointly conducted a project for controlling the breeding of the malaria-carrying mosquito, *Anopheles quadrimaculatus,* to reduce potential malaria transmission in extra-cantonment zones and areas of essential war industries. Field operations did not begin until late in the year, but 80,000 feet of drainage ditches were cleared and 14,000 ft. of 4-ft. wide ditch was excavated.

One of the interesting phases of the project is that relating to the control of the *Anopheles quadrimaculatus* in those areas of the Potomac River infested by the water chestnut (*Trapa natans* or water caltrop). The plant appears on the surface of the river as a mat or blanket thick enough and buoyant enough to support large birds. In the small patches of water between the leaves of the plant "quads" breed in great numbers. Breeding, however, does not occur all over the area covered by the water chestnut. Since it is estimated that nearly 90 percent of the water chestnut infested areas of the Potomac River is within the Maryland boundaries, the control of mosquito breeding therein is of concern to the State Department of Health. During the year some airplane dusting was carried on but not in accordance with any definite program.

Typhoid Fever in Maryland

Typhoid fever mortality in Maryland in 1942 was the lowest on record—0.4 per 100,000. This is only one percent of the rate in 1910—42.8, and is one-third of the average for the previous five years. The gradual improvement is shown by the averages of the successive 5-year periods—25.5, 12.7, 7.1, 5.5, 2.3 and 1.2.

The record for Baltimore City has been still better. The averages for the same 5-year periods were: 21.2, 8.9, 4.2, 3.4, 0.9 and 0.5. The average for 1942 was but 0.7% of that for 1910.

The above figures are from the 1942 Annual Report of the Bureau of Sanitary Engineering, Maryland State Dept. of Health.

Pulverizing old asphalt prior to adding aggregate.

Building a Soeme

By HAROLD H. HERZOG

Highway Commissioner, Kenosha County, Wisconsin

THE need had long been felt in Kenosha County for a type of highway which would approach the ability of a Class A type pavement to carry heavy traffic loads; but without prohibitive cost, since funds were not available for constructing Class A highways. In searching for such a type, several were tried and of them soil-cement was found to be very satisfactory. To give it a thorough test we selected for a trial road a mile of County Trunk Highway H, which is one of the main traffic lanes between Kenosha and Racine, carries a large volume of traffic and has failed consistently when treated with the usual dust palliatives and asphalt skim mats.

This road consisted of three to four inches of gravel mixed with SC-7 asphalt, which was very satisfactory during summer months. But the subsoil was a heavy yellow clay between A6 and A7 as defined by the Bureau of Public Roads, was very active and responsive to changing moisture conditions and therefore very susceptible to frost action; and each spring, to repair the damage caused by such action, it was necessary to scarify a large portion of the wearing course and mix in fresh asphalt. We wished to learn what effect frost action would have on a soil-cement pavement.

It would mean a substantial saving in labor and material if we could use the old asphalt mat as part of the material for the new pavement, and tests conducted by a commercial soils laboratory, The Oskosh Industrial Laboratory, indicated that, if this mat were scarified and pulverized to approximately its original gradation, it would be suitable for incorporation into the contemplated soil-cement pavement, furnishing three inches of the six-inch thickness desired. It was lacking in the finer particles desired, but these were supplied in the additional three inches of sand and gravel that had to be added, this added material being selected to give the entire mixture the desired gradation.

Contract for the work was let to the Sarrington Construction Corporation of Lake Delton, Wis. The first step in construction was to scarify the old asphalt, care being taken not to dig too deep into the underlying clay, as this had considerable coarse aggregate embedded in it and it was thought that this would be of more value if left to serve as a firm sub-base than if incorporated into the soil-cement. In scarifying and partly pulverizing, a 24" offset disc in conjunction with Seaman Pulvi-mixers was used. Although the contract called for pulverizing 80% of the pulverizable material so it would pass a No. 4 sieve, it was found unnecessary to pulverize it as completely as this, since additional pulverizing was obtained by the succeeding processing.

Dry mixing cement and aggregate.

When the material had been acceptably pulverized, it was windrowed to one side of the grade and covered with the additional aggregate needed to secure the 6-inch thickness; this preventing the windrow being compacted by the construction vehicles.

The second step was to spread, to a width of 20 ft., enough of the windrow for one day's processing. Then cement spreading operations were begun at three o'clock the next morning so that they would be far enough along by eight o'clock to permit the tractor operators to start work immediately. Thus the cement spreaders put in their full time and went home, having completed their work without interfering with tractor operators; who also could thus put in a full day without any lost time or overtime payment.

In order to spread the pre-determined percentage of cement uniformly, the cement sacks were spotted by use of a rectangular frame of 1 x 2-inch strips of wood, the dimensions of the frame being such that placing a bag at each corner gave the desired spacing. One man handled this frame, placing it on the ground with two corners on two of the bags already spotted; then two new bags of cement were placed at the other two corners by men who received them from two men in the back of the cement truck. Other men emptied the bags on the ground in windrows transverse to the road, each bag of cement reaching half way to the bag on each side. Following this, a spike-tooth harrow (such as most farmers have) was used to level and spread the cement windrows, the teeth being set almost flat to secure the best leveling effect. This made a complete round trip over each section so that cement carried in one direction when going up would be car-

Cement Road in Kenosha County

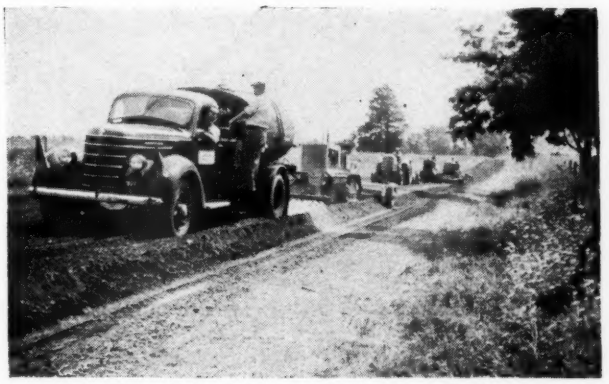
Description in detail of method of construction, using pulverized old asphalt mat as part of the aggregate. List of equipment used, and cost.

ried back on the return, giving a uniform spread.

As soon as one lane of cement had been spread, dry mixing was begun, using a spring-tooth cultivator with a depth control device pulled by a small crawler-type tractor. This was to keep the old asphalt from packing under traffic, while the actual mixing was done with two Seaman Pulvi-mixers of the power take-off type which followed directly behind the cultivator. After the mixers had made several round trips, plowing was begun, starting at the center of the road and progressing to the outside edge. Great care was exercised to see that the plow skipped no part of the section and operated at the correct depth, several men being assigned to work with the plow to constantly adjust its depth; too deep plowing would decrease the percentage of cement and too shallow would weaken the structure. Plowing was followed by one more mixing operation, and this by application of water.

Application of water is one of the most important steps in the entire procedure, and in order to insure using the right amount, tests of the soil mixture were made each morning to determine the quantity to be added to obtain the optimum content. Water was applied by using two 1,000-gal. asphalt distributors, the rate of application being controlled by use of the tachometer with which they were equipped. It was found advisable not to attempt to add the full water requirement in one pass, but rather to make several trips, so adjusting the rate that the distributor could completely cover the entire section with moisture on each trip. The mixing equipment was kept continually in operation, so that each increment of water was mixed into the soil as rapidly as it was sprayed on the surface of the aggregate, water migration was prevented, and a uniform moisture content secured. This was very beneficial in the packing-out operation, because

Plowing for dry mix.



Adding water and mixing to prevent migration and evaporation.

it aided greatly in securing uniform density. As the amount of water in the soil approached the theoretical required for optimum, another test was taken to determine the extra amount of water required to offset evaporation, percolation, run-off, etc., and this amount was then added. When approximately eighty per cent of the required moisture had been added, another plowing operation was undertaken, starting from the edges and working to the center, which tended to overcome any soil displacement caused by the first plowing operation. The remainder of the water was then added and mixed in.

As forms were not used along the edges, straight sides were obtained by the use of a power grader which continually patrolled along the edges, maintaining them in a straight line. During compaction, the edges feather-edged under the action of the sheepsfoot roller, but this was not found to be particularly detrimental, as the shoulders were raised to the new grade at a later date. It was found advisable, when the windrow was first flattened out, to hold the initial leveling operation to close tolerances in order to avoid appreciable displacement of the final mixed soil-cement. If this had not been done, it would have been necessary to move considerable material to secure a level grade by doing a major leveling operation at the conclusion of the mixing. This aided very greatly in obtaining uniform thicknesses throughout the section, so that, at the completion of the mixing operation, it was possible immediately to start using a sheepsfoot roller attached to a crawler-type tractor. Compaction was started on the outside edges and progressed to the center, since the outside edges required more compactive effort than the middle section. Sheepsfoot

(Continued on page 32)

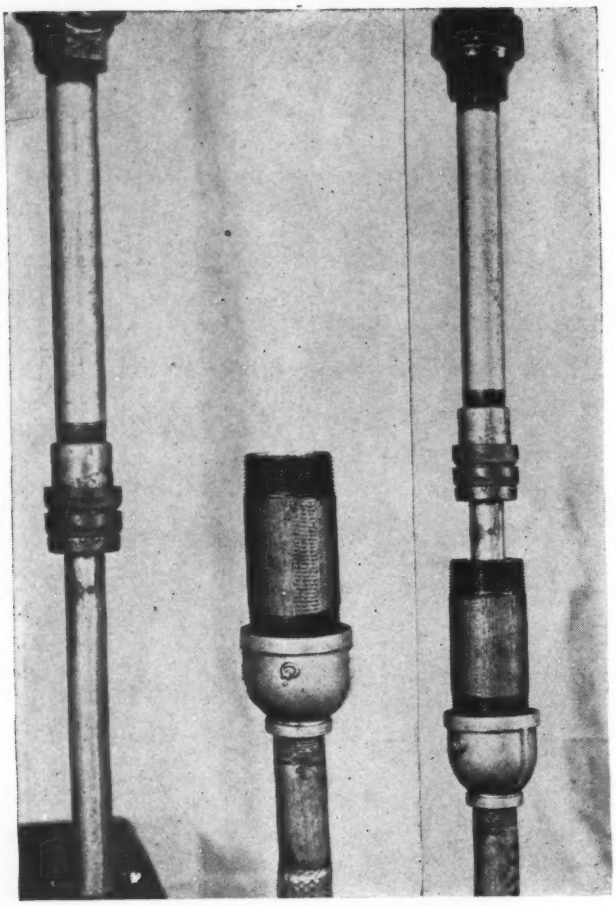


Fig. 6—Method adopted by Health Department.

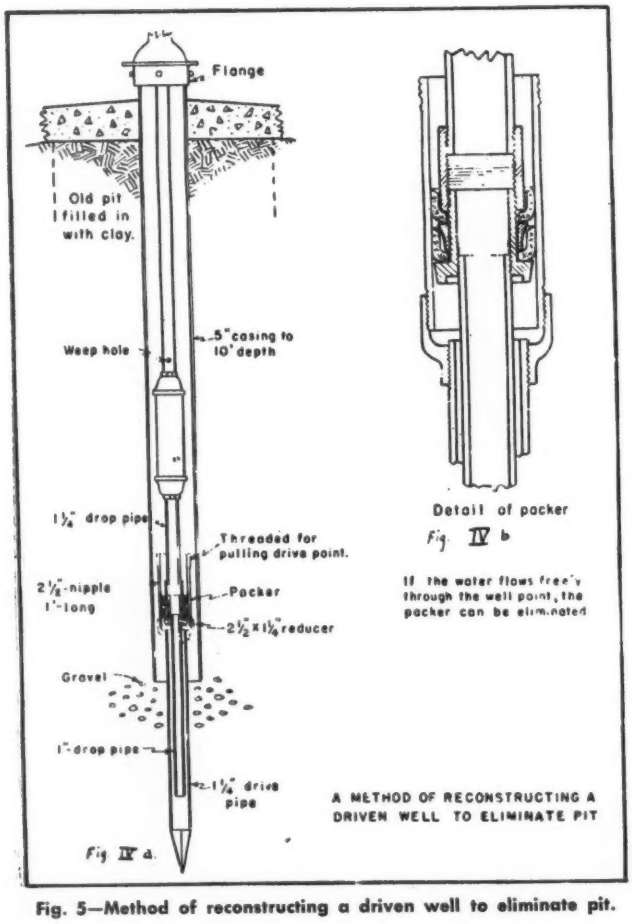

Flange
Old pit filled in with clay.
Weep hole
5" casing to 10' depth
1¼" drop pipe
Threaded for pulling drive point.
2½"-nipple 1'-long
Packer
2½" x 1¼" reducer
Gravel
1"-drop pipe
1¼" drive pipe
Fig IV a.
Detail of packer
Fig. IV b
If the water flows freely through the well point, the packer can be eliminated
A METHOD OF RECONSTRUCTING A DRIVEN WELL TO ELIMINATE PIT

Fig. 5—Method of reconstructing a driven well to eliminate pit.

Some Aspec D

By H. R. SHIPMAN

Assistant Sanitary Engineer, Farm Security Administration, Minnesota*

IT has long been recognized that, other things being equal, the deeper the well, the more protection it receives from surface pollution. In rural areas where a water table can be reached at comparatively shallow depths (usually 10 ft. to 50 ft.), driven wells and dug wells are generally found in rather large numbers. Shallow wells are constructed because they are cheaper for the small farmer and can usually be constructed by him without professional assistance.

Most health departments have accepted the fact that shallow wells will probably always be in existence and have set up standards for construction intended to safeguard such wells as far as possible. For dug wells there seems to be more or less universal acceptance of the buried slab type of construction over other methods, where this method is found feasible.

The Farm Security Administration, working with the State Department of Health in Minnesota, investigated 824 wells during the year 1941. Of this number, 609 were on farms situated in the cut-over area where shallow wells are common. Of the 609 wells, 88 were driven. Of these 88, 86 were not constructed in a manner that could be considered satisfactory from a public health standpoint. The most common defects were well pits and wood platforms. The pits were used to prevent the wells from freezing and to gain access to the cylinder for repair. In reviewing Department of Health bulletins from several states on methods for constructing driven wells, the author found many examples of recommended construction which were either not practical from an operation standpoint or were not feasible from a repair or maintenance standpoint. Only those types of construction were considered which required no pit for operation and maintenance purposes, since it is believed that nearly all Sanitary Engineers recognize the objections associated with wells surrounded by such pits.

Among the methods tried out and the advantages or disadvantages of each are:

1—The placing of an outer casing over the drop pipe and cylinder (See Fig. 1). This method requires the pulling of the point every time that cylinder leathers are repaired or repairs on the cylinder are made and is impractical for driven wells of depths greater than 20 ft. This method worked satisfactorily where driving was easy and where the subsoil was such as to allow the outer casing to rest on sand or gravel.

2—The use of a tubular cylinder and an eductor pipe of p & r pipe from the pump to the cylinder of the same diameter as the cylinder, and the placing

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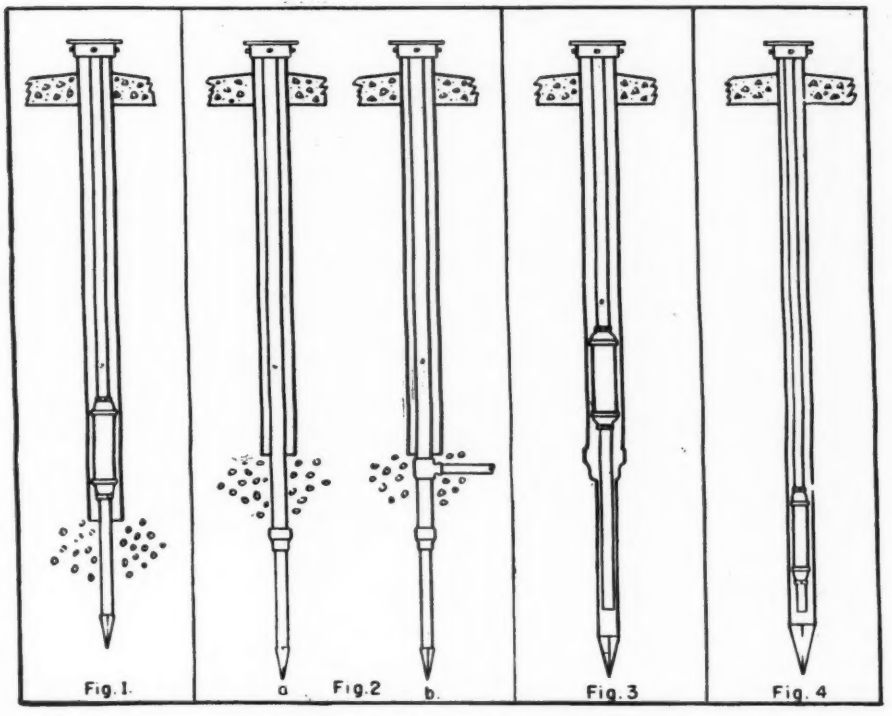
Driven Well Construction

Methods considered and the one finally adopted for eliminating pits at the head of driven wells. Reconstructing existing wells to conform to this plan.

of an outer casing around the drop pipe and cylinder (See Fig. 2). This method permits repair of cylinder leathers, etc., without disturbing the point; but for the average farm well, where a 2″ tubular cylinder is usually used to replace a 3″ regular cylinder, an inadequate quantity of water is obtained. The biggest advantage of this arrangement is that it permits the installation of an underground discharge pipe by inserting a T in the eductor pipe above the cylinder as shown in Fig. 2 b.

Tubular cylinders larger than 2″ in diameter are costly and require a p & r pipe of correspondingly larger diameter, which increases the quantity of water coming from the weep or vent hole to such an amount that danger of freezing from water building up in the outer casing is greatly increased. The outer casing must rest on sand or gravel or other porous soil.



Methods tried by Dept. of Health for eliminating pits.

3—The connecting of an outer 5″ casing to the drive pipe by a 5″ x 1¼″ reducer and the suspending of the drop pipe and cylinder inside (See Fig. 3). This method is objectionable because in some wells suction is required to draw water into the point. No suction can be placed on the point by this method. Also, should it ever be necessary to pull the point, the 5″ casing also must be withdrawn. This could probably be done, but to get it back in again would be difficult.

4—By driving a 2″ point with a 2″ pipe and suspending a 1 13/16″ cylinder with 1″ drop pipe inside (See Fig. 4). This method is objectionable because of the small amount of water pumped and because of failure to operate where suction is required to draw water through the point. Where either of these two objections will not be serious, this method is satisfactory.

A method worked out, which has been tried with considerable success and which overcomes many of the objections of the methods described above and yet has most of their advantages, is shown in Fig. 5, IV a. Fig. IV b shows the packer arrangement used when needed with this type of construction.

To reconstruct an existing driven well, it is only necessary to unscrew the cylinder from the drive point in the pit, screw a 2½″ nipple 12″ long to the 1¼″ drive pipe by means of a reducer, bush a 1″ drop pipe into the cylinder and lower the drop pipe into the 1¼″ drive pipe as shown. The well should be pumped to determine whether the water will flow freely through the point or whether suction will be needed. Should the well fail to pump water for any period and start to suck air, the packer arrangement shown in Fig. 6 will have to be installed.

The packer is made up from a 2½″ plunger with the cage and valve removed. The top of the average 2½″ plunger has sufficient stock to allow for 1¼″ tapping and the bottom for a 1″ tapping. A 1¼″ pipe from the cylinder will then be screwed into the top of the plunger and a 1″ drop pipe into the bottom. The arrangement is then lowered into the drive pipe and the plunger slipped into the nipple, which should preferably be plugged and reamed to avoid tearing of the packer leathers.

The 5″ outer casing should then be lowered into place. A 10 ft. minimum depth is recommended for the outer casing, and where a packer is used this casing should be rested on gravel. It will, in most cases, be advisable to dig the pit to an 11 ft. depth

and place 1 ft. of gravel in the bottom on which to rest this casing. The pit should then be filled with clean, compact clay and, after allowing to settle, a concrete platform constructed. If a packer is not used, the outer casing need not rest on gravel since the weep hole waste water will return into the well.

For future repair to the cylinder, the drop pipe, packer and cylinder slip out easily. For future replacement or cleaning of the point, a pipe is lowered with a reducer of 2½" diameter which is screwed onto the nipple and the point pulled.

The advantages of this method are:

1. It is inexpensive, since the existing cylinder is used. The packer is installed only when found necessary.
2. It provides the same quantity of water as originally.
3. It is easy to repair.
4. It permits placing the point under suction when necessary.

Although this method is intended primarily for the reconstruction of existing driven wells in order to eliminate the pit, it can be used for new construction also by digging the pit and filling it in after construction, or by augering to an 11 ft. depth and driving until water is reached, pulling back the drive pipe and cutting it off at the required point and driving it back down.

Driven wells will probably always exist as sources of water for low-income families living in areas where the water table is comparatively shallow. The method of driven well construction described above is believed to afford ample protection to the water in the well and at the same time provide certain distinct advantages from a maintenance standpoint.

A Concrete Road 1¼ Inches Thick

A few months ago there was laid, in a "military establishment" in England, a trial length of road called the Waller-Denison track, of which Major J. H. W. Waller is the principal originator. The aim was a pavement making full use of the natural support of the soil, of the minimum practicable thickness and earliest use after laying. The pavement was laid directly on the sod of a grassy land, no grass being removed except a few clumps of coarse tall grass, and no grading except filling spots below grade, the maximum fill being 9". Two 6" x 18" concrete curbs were constructed to form the edges of the 40-ft. pavement, the tops troweled to exact pavement grade. Then the ground between curbs was covered with 1½"-2½" stone only one layer thick and rolled with a 2½ ton roller, bedding the stone but not bringing earth to the surface. This raised the surface just over ½". This was covered with ¼" to ½" of cement grout, on which were laid loosely woven mats of coir to serve as reinforcement and rolled with the 2½ ton roller, squeezing the grout through the mat. While the grout was still wet, the concrete surface was laid ¾" to 1" thick after screeding, using the side curbs as screeds. This concrete was mixed 1 part cement, 2½ gravel graded from ⅜" down, and ½ sand. Transverse expansion joints filled with a 3:1 sand-bitumen mixture were provided at 54 ft. intervals. Within four days of completion, army transports in considerable numbers were using this track; and seven days after laying, two 9-ton vehicles were driven in all directions over it, with no visible effects. After three months of almost continuous traffic "the major portion of the work is standing up very well, though it is noticeable that hair cracks are developing."

Effect of Discontinuance of Chlorination of Sewage Plat Effluent

In view of the importance of chlorine in the war program and its restriction for non-essential uses, steps were taken by the Maryland State Dept. of Health in 1942 to limit its application where conditions made such action possible. At the Anacostia River sewage treatment works in the Washington Suburban Sanitary District, permission was given to the Sanitary Commission early in the year to discontinue chlorination of the effluent for the duration of the war, resulting in a daily saving of approximately 300 pounds of liquid chlorine. In arriving at this decision consideration was given to the fact that the Anacostia river, which receives the sewage effluent, flows through the southern portion of the District of Columbia before reaching the Potomac river. Since neither stream is used for water supply purposes below the plant outfall, and as the nearest shellfish beds are approximately 65 miles below Washington in the Potomac river, the temporary stopping of disinfection of the sewage effluent appeared to be warranted at this time.

In view of the discontinuance of chlorination during 1942, it is interesting to note that the average B.O.D. of the plant effluent during the year, as shown in the following table, was slightly less than in the previous year when continuous chlorination was practiced, due to a weaker raw sewage.

		Suspended Solids			*B.O.D.*		
Year	*Flow m.g.d*	*Raw Sewage p.p.m.*	*Effluent p.p.m.*	*Percent Removal*	*Raw Sewage p.p.m.*	*Effluent p.p.m.*	*Percent Removal*
1941	5.6	150	45	70	139	79	43
1942	7.28	133	56	57	117	77	34

The average daily sewage flow for 1942, approximately 30 percent greater than in 1941, is noteworthy. This increase may not be entirely attributed to the additional population served. It is likely that a large part of the increased flow was due to storm water and probably infiltration finding its way into the sewerage system. Rainfall data support this assumption. In 1942 the total precipitation in the Washington area was 52.03 inches compared with 29.17 inches in 1941, which is 12.99 inches below normal.

The greater population served by the Anacostia sewage works in 1942 resulted in an increase in the total sludge produced in the primary clarifiers by 18 percent, and gas from digesting sludge by 17 percent. During the year an average of 31,298 gallons of wet sludge was removed daily from the clarifiers and 66,950 cubic feet of gas produced.

Policing Municipal Water Supply Sources

The Alabama Supreme Court has ruled that a city can, under its police powers, make regulations governing its municipal water supply (such as preventing fishing in its source of supply), even though this be in another county.

"Such police jurisdiction is natural and probably necessary, incident to the right to own and operate a municipal water-works plant outside and beyond the general police jurisdiction of the city," the court said.

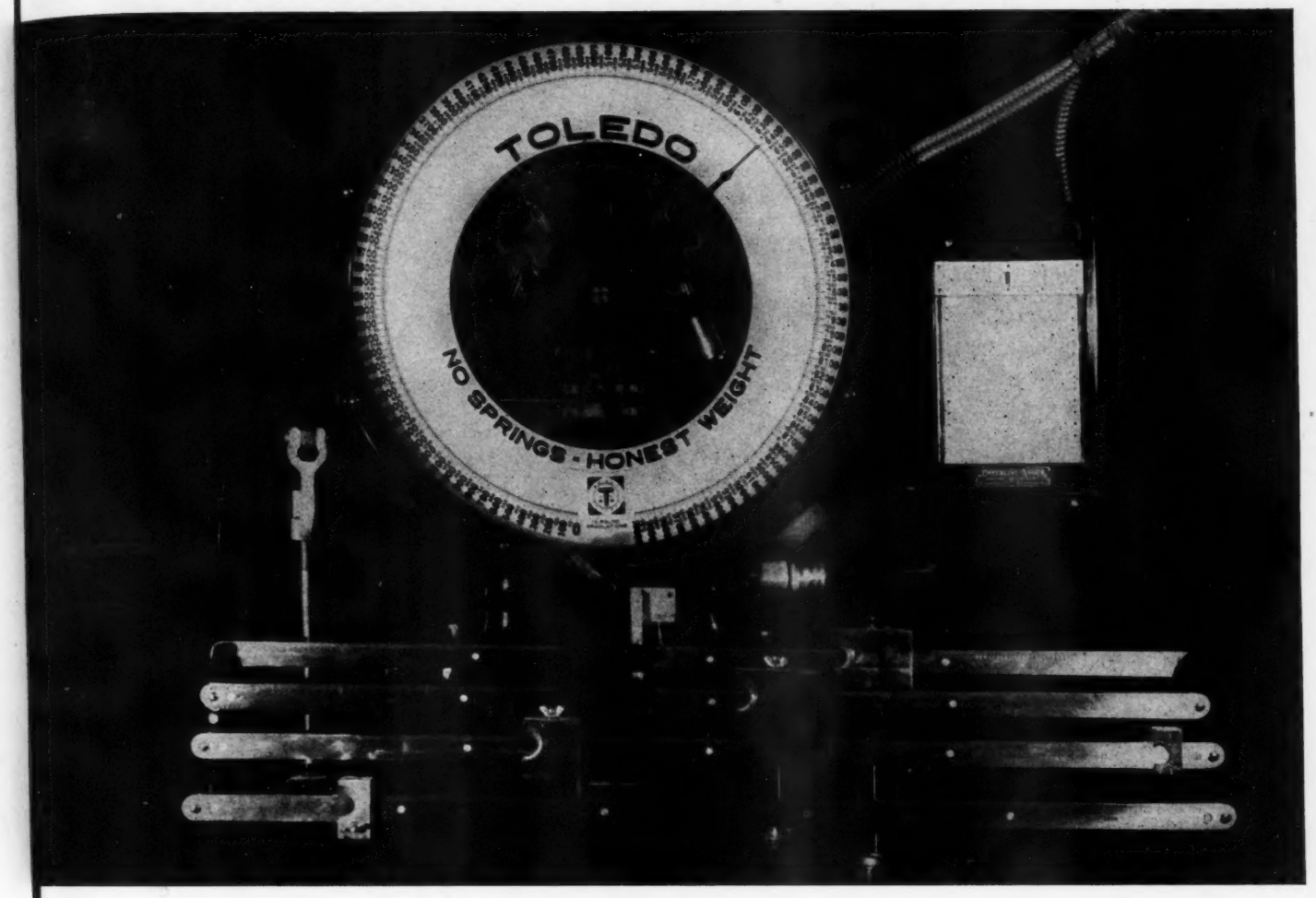


Figure 3—The (sc)^2 compensator batching scale.

Precision in Batching Concrete

Development in the science and equipment of concrete mixing. Method of allowing for moisture in coarse and fine aggregates, to a fraction of one percent, without any calculation or delay.

IT IS difficult to imagine the construction of present-day structures without the use of portland cement concrete; but it is only 72 years since the first portland cement—made in England—was used in this country. Its manufacture in the United States began in the 70's, was under 50,000 barrels in 1890, and has now reached over 13 million barrels a year. However, concrete had been made in this country with "Natural" cement since 1820. This cement was made in this country, a total of 25,000 barrels previous to 1830, reaching a peak of 8,070,000 barrels in the decade 1890-1899, after which it was rapidly replaced by portland. The first concrete pavement in the United States was built in 1892.

Although concrete has been made in this country for over a hundred years, scientific methods of proportioning the ingredients and of mixing are of recent growth. In 1886, when the writer began engineering practice, standard practice was to use 1:2:3 mix for first quality concrete, 1:3:6 for foundations, etc.—anything as elaborate as a water-cement ratio was undreamed of. Also all mixing was done by hand with shovels on a platform, water being thrown on from a bucket until the consistency satisfied the foreman or inspector. By 1900 some so-called mixers were in use, but even in 1910 a common clause in specifications was: "If mixed by mechanical mixers, the concrete shall be equally as good as though mixed by hand." In 1909 this magazine published an article on mixers in which it classified them as continuous, batch and gravity types. The common type of continuous mixer was an iron trough in which a screw conveyor carried to the discharge end ingredients fed into the other end by shovels, proportioning being obtained by having one man shoveling sand and two shoveling stone. It was admitted that this "does not produce as uniform results as a batch mixer." One type of gravity mixers consisted of three or more hoppers placed one above the other, the ingredients placed separately in the top hopper being more or less mixed by the time they fell from the bottom one. A simpler form was a trough provided with baffle plates

and set nearly vertical, down which the ingredients fell from baffle to baffle. Batch mixers then were just reaching a practicable stage, among the makers being Koehring, Chain Belt, Ransome and T. L. Smith; but with the improvements rapidly made, their superiority over the other types was soon demonstrated and this is now the only type in general use.

Growth in the art of mixing has been accompanied by increased knowledge of the scientific principles involved, resulting in the "surface-area" method of proportioning, the fineness-modulus," the "void-cement ratio" and the "water-cement ratio." Embodying these ideas in practice involved the use of much more accurate methods of measuring than by the shovelful or wheelbarrow-load. Difficulties in securing accurate measuring by bulk have led to the general use of gravimetric equipment.

With accurate measurement thus made possible, a further refinement has been added—allowance for the moisture already existing in the aggregates. If such precision should seem unnecessary, even useless, a little calculating may be helpful. The water-cement ratio selected by a designing engineer is that calculated to give the concrete the strength on which the design is based. If more than the designed amount of water is used, the strength will be less; and since this is possible, even probable because of the varying amounts of moisture in the aggregates, the designing engineer allows for this with a factor of safety, thus increasing the amount of cement used and the cost. The water content of sand used as fine aggregate has been found to vary from nothing to 15% of the dry weight, that from a given pile changing as much as 2% in an hour. Assume that the design W/C was 0.66, or 1.52 lb. of cement per pound of water, to give 2500 lb. concrete; and that the moisture in the gravel was 1% and in the sand 2%, while none was allowed for. Then the designed and actual quantities in a typical mix would be:

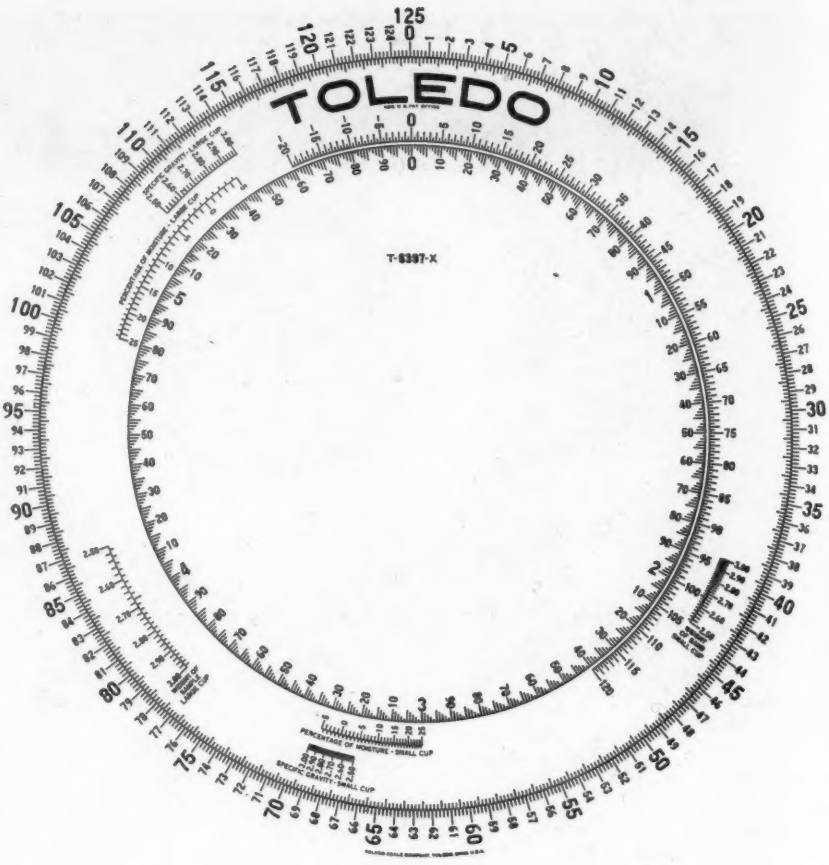


Figure 2. The (SC)² Moisture Meter Dial.

Figure 1. (SC)² Moisture Meter.

Material	*Designed Mix*	*Actual Mix*
Cement	455 lb.	455 lb.
Sand	1,310 lb.	1,284 (1310 less 2%)
Gravel	1,950 lb.	1,931 (1950 less 1%)
Water	300 lb.	345 lb. (300 + 26 + 19)

The concrete then would have 1.32 lb. of cement per pound of water instead of 1.52, a ratio which gives an expected strength of 2,000 lb. instead of 2,500. To provide for such a possible moisture content of aggregates would require increasing the cement content by 68 lb. (45 lb. x 1.52), which, at $2.00 a barrel, would cost 36 cents a cubic yard; which could have been avoided had the engineer been sure that the moisture content would *be known for each batch and allowed for*. That is, in the above case, if it were known that

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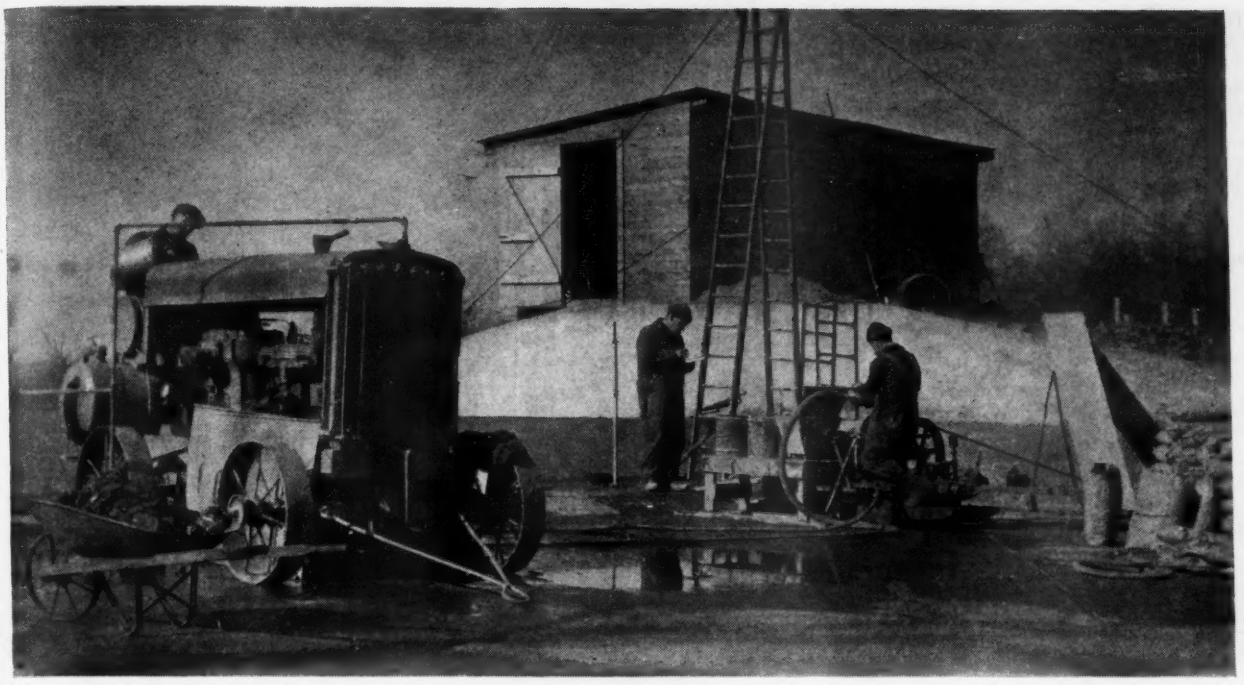


Compressor and grouting machine in operation.

Foundation Grouting of a Reservoir

By HARRY C. McCREA
Borough Manager, Blairsville, Pa.

Faulty foundation under core wall of fifteen-year old dam made watertight. Investigation and grouting methods described in detail.

IN 1926 the Borough of Blairsville, Pennsylvania, constructed an impounding reservoir having a capacity of 33,000,000 gallons; the dam being an earth-fill structure 600 ft. long with a concrete core wall extending to bed rock, and a concrete-paved spillway at one end. It was the original intention, according to the plans, to grout the foundation underneath the core wall, and 3″ grout pipes were placed in the core wall on 8 ft. centers, extending to bed rock. Unfortunately, however, the grouting itself was omitted.

The rock structure in this region is mostly badly broken and highly porous limestone and blue rock, and that under the reservoir, in addition, contains a small vein of coal which lies in some places within 18″ of the bottom of the core wall. These factors make the location none too desirable for reservoir construction.

Some leakage developed shortly after construction, and an attempt to stop it was made by extending the core wall near the spillway, but with no effect. In the spring of 1937 a boil developed at the toe of the embankment at about its midpoint, and as the leakage was increasing I made a thorough investigation to determine its cause and extent. As the escaping water was highly discolored by sulphur, it seemed probable that it was passing through the seam of coal under the core wall; which idea was confirmed by our later drilling of grout holes.

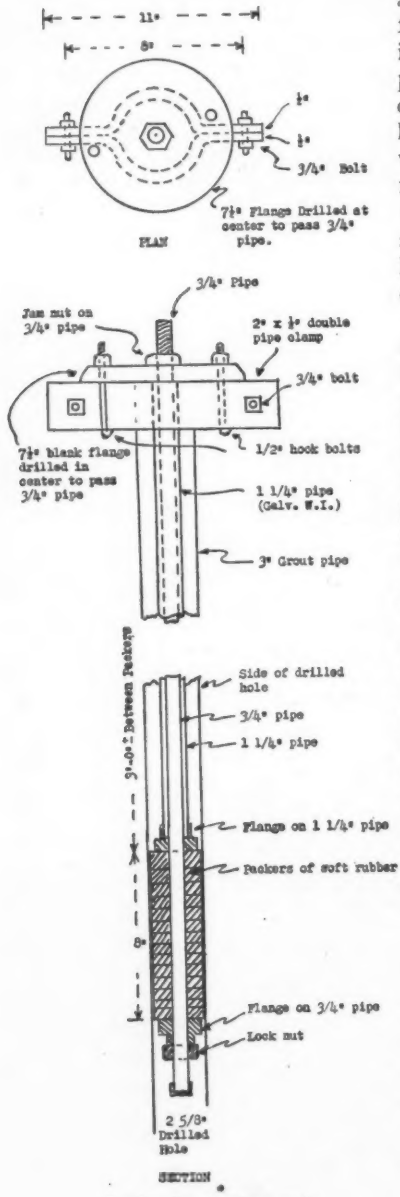
The first step in the investigation was to open up all the grout pipes and determine which ones contained water, and how much. Some of the pipes were found to be dry, while others contained water to the elevation of the surface in the reservoir. In some pipes the leakage was so bad that, after filling them completely with water, the surface of this fell as rapidly as 6″ per minute.

In an effort to locate the areas of greatest leakage, water was forced into each pipe in succession by means of a hand-operated pressure pump, a pressure gauge and a water meter being installed in the line between the pump and the grout pipe. Under pressures ranging from 10 to 30 pounds, water was forced through the pipes in quantities varying from zero to 2 gpm. These tests showed that the worst sections of leakage were located between the spillway and the gate house; also that a section of the dam at the extreme end from the spillway was affected.

In order to determine to what extent the embankment was saturated, a hole was churn-drilled in the slope opposite each grout pipe and midway between the top and the toe. These holes showed that in some areas the embankment was saturated to within 2 ft. of the surface, and I was convinced that something must be done to stop the leakage to insure the safety of the structure. Accordingly, a contract was let for diamond

Steam-operated pump. Spillway in background.

drilling the foundation underneath the dam. The drills were lowered through the group pipes where possible, but some of the group pipes had been carelessly placed and it was impossible to get the drilling tools through them, in which cases a hole was churn-drilled to bed rock directly below the core wall, a grout pipe inserted, and diamond drilling continued from the bottoms of these pipes. Grout pipes also were inserted at 8 ft. intervals through the floor of the spillway above the crest, which was 61 ft. wide, the process being as above after drilling through the spillway pavement. The contract price for the diamond drilling was $1.60 per foot of core, and $1.90 per foot for any grout pipe it was necessary to place. A core was obtained from each hole, and all cores were boxed and numbered so that they could be studied in controlling the grouting operation.



Device for testing rock permeability.

In each hole, drilling was continued until it had passed through the broken strata into solid rock; or where the hole passed through coal, it was stopped when fireclay was encountered. Where the pumping tests had shown the most leakage, we found the rock badly shattered, and many of the crevices were badly discolored by sulphur that had leached from the coal.

Testing the Holes

After a few holes had been drilled and thoroughly washed free from all cuttings, testing the permeability of the rock in each hole was begun. This was accomplished by forcing water into a core hole under pressure and noting the amount of water entering it during a given period of time and the pressure used; a test being made of each successive 3-ft. section of the hole.

For making these tests we used the device shown in the illustration, which enabled us to force water under pressure into any desired 3-ft. length of the drilled hole. This consisted essentially of two packers spaced 3 ft. apart vertically and connected by a perforated pipe, the packers fitting loosely in drill hole until subjected to pressure at their ends, when they expanded into a water-tight fit. Then water forced through the pipe perforations could enter the rock between the packers but nowhere else. For effecting this, a ¾" pipe was placed inside a 1¼" pipe, extending about 4½ ft. below it. Over the bottom of the smaller pipe were slipped a number of rings of soft rubber making a total length of 8", which were held in place by a flange and lock nut on the ¾" pipe, which then was capped at the lower end. On top of this packer was a 3 ft. length of 1¼" pipe with a flange at each end, the bottom flange resting on the lower packer, the top one supporting the upper packer, which was a duplicate of the lower one. Above the upper packer was a length of 1¼" pipe having a flange at the bottom which rested on the upper packer, while its upper end bore against a 7½" blank flange which had been drilled to pass the ¾" pipe. The ¾" pipe, passing up through this flange, was threaded and provided with a nut. By tightening this nut, the two packers were compressed between the two pairs of flanges. Both pipes were perforated between the packers so that water pumped into the ¾" pipe could enter the drilled hole there and there only. The rubber rings used in the packers were made for us by the McCreary Rubber Co. of Indiana, Pa., from the kind of rubber used in making inner tubes, which expands easily.

In using this device, it was lowered through the grout pipe to the bottom of the core hole by means of a block hung on an A-frame made of two ladders lashed together, additional lengths of ¾" and 1¼" pipes being added as necessary. Then the distance from the top of the grout pipe to the first packer was recorded and the ¾" pipe connected to a pump, with a pressure gauge and water meter installed in the connecting line. Water was pumped into the hole for 4 or 5 minutes, the amount per minute and pressure being recorded; then the test device was raised three feet and another test made, and this was repeated, the last test being made with one packer in the grout pipe and the other in the rock below. This rock immediately below the grout pipe showed more leakage than any other part of the hole.

The logs of the different rock strata that had been encountered in diamond drilling the several holes were platted to scale, and the pumping test data—amount

(Continued on page 28)

Harry C. McCrea and son.

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Pre-Cast Concrete Curb in Lee, Massachusetts

By **LOUIS A. AIROLDI**
Superintendent of Highways, Lee, Mass.

Description of form and method of use for casting 6″ x 16″ x 5′ curb blocks, and cost of making and setting blocks.

Louis A. Airoldi

WEST Park Street in Lee, Mass., was reconstructed in 1941 and paved in 1942 with mixed-in-place retread. Most of it was uncurbed, but about a thousand feet of this road was on a side hill with the residences on the down-hill side below the shoulder of the pavement, and it was necessary to construct a curb here to prevent the surface water from washing the shoulder and flooding the cellars. Since a curb on one side of the street only would present an unbalanced appearance it was decided to curb both sides.

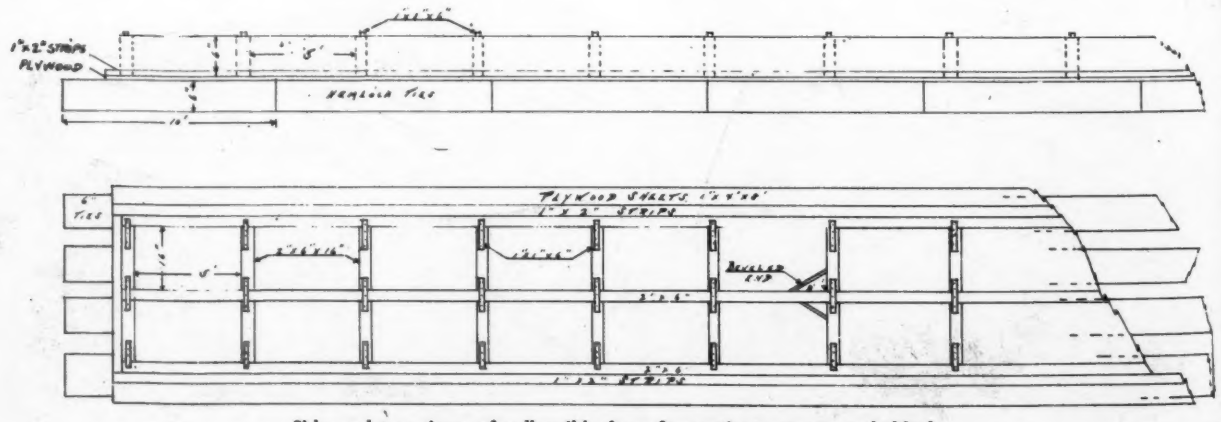
It was impracticable to construct the curb before paving, because of the mixing and spreading procedure employed with mixed-in-place surfacing. To construct concrete curb in place after the surfacing was finished would necessitate considerable patching between curb and road top due to the excavation necessary for setting the forms, and the mess made by mixing the concrete would be objectionable. Granite curb was the most permanent type available, but because of the cost of this we decided to use unreinforced precast concrete blocks, making them ourselves at the Highway Department quarters.

The blocks were made 6 x 16 in. in 5-ft. lengths, in breakdown forms shown by the accompanying sketch, which were very simple to construct and easily broken down and reassembled. An ideal base would have been a concrete floor under cover, but as this was not available we made a solid base as follows: Twenty-four 6″ x 10″ hemlock ties, 10 ft. long, faced on two sides, were placed end to end in four rows with the outside rows 4 ft. apart, bedded and leveled. On these was nailed a floor consisting of seven 4 ft. by 8 ft. sheets of 1″ waterproof plywood.

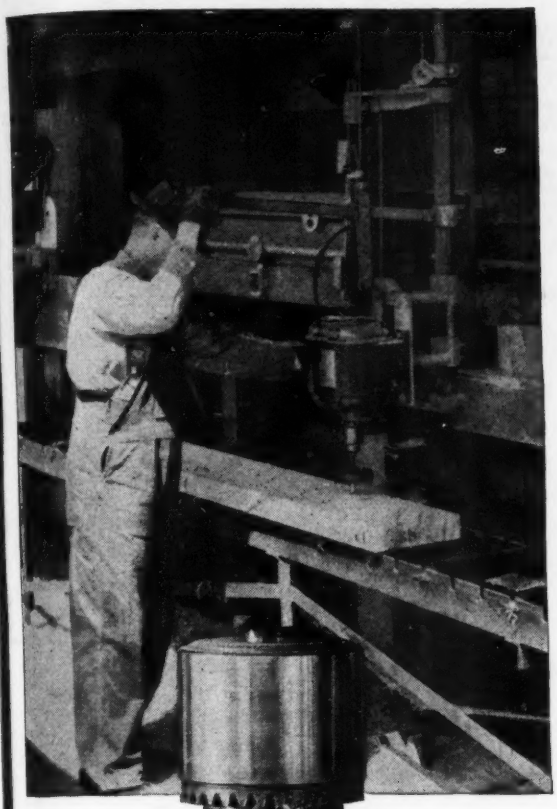
On this floor were nailed two rows of 1″ x 2″ spruce strips 38″ apart as a footing for the forms, which were made of 2″ x 6″ fir. Two outside forms and one between them (serving as a form common to two curbs) were separated and braced firmly by cross pieces of 2″ x 6″ x 16″ fir spaced to give blocks 5 ft. long and held in place by pieces of 1″ x 1″ x 6″ tacked lightly on top with four No. 6 nails. The forms were coated with old crank case oil before pouring.

The concrete, mixed 1 part Atlas cement, 2 parts sand and 3 parts ¾″ stone, was mixed in a "Wonder" half-bag concrete mixer, just wet enough to float easily. With 2 men shoveling aggregate, 2 with wheelbarrows, 1 handling cement and water and dumping

(Continued on page 34)



Side and top views of collapsible form for casting concrete curb blocks.



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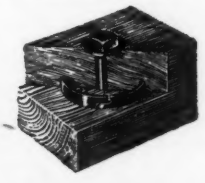

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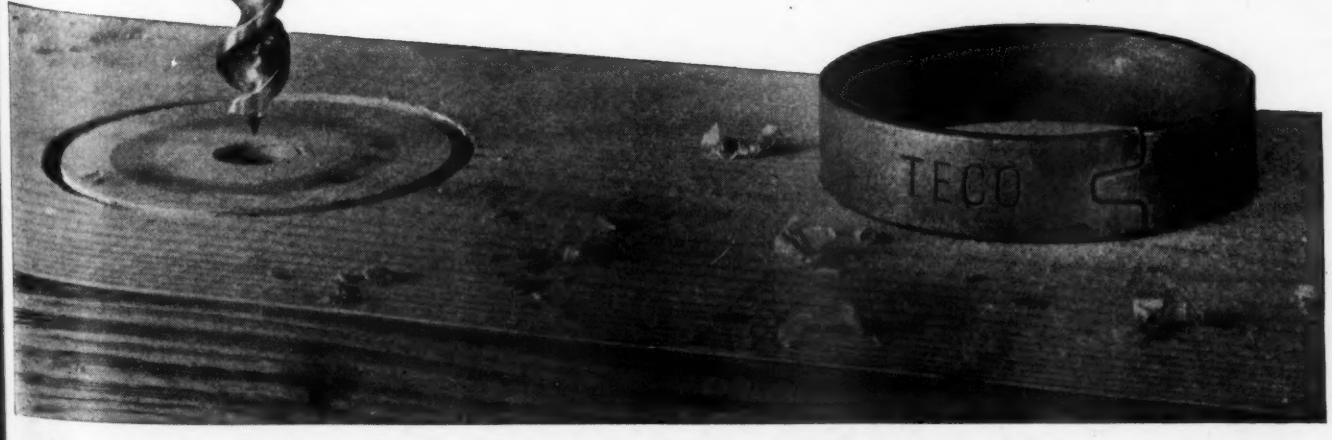

Foundation Grouting of a Reservoir

(Continued from page 24)

of water pumped and pressure used at each depth—were platted to the same scale; and a comparison of the two for each well gave a very complete picture of the leakage conditions at the different depths, which enabled us to determine the consistency of the grout mixture to be used in the grouting operation.

When pump-testing several of the holes, water passed through fissures in the rock to adjacent core holes—in one case to holes 40 ft. distant, clearly indicating the presence of a well-defined fissure here. In fact, while drilling several of the core holes, water used in the diamond drills disappeared into fissures, in some instances reappearing in adjacent core holes.

Grouting

In grouting, the same device was used as in testing the holes, but modified by removing the upper packer and the cap at the lower end of the ¾" pipe, and eliminating the perforations in the pipes. Then, with the packer compressed, grout was forced out of the end of the ¾" pipe but could not escape upward.

We used a Union grout machine of the horizontal type, holding one bag of cement at each charging. The machine was operated by an air compressor having a capacity of 220 cubic feet, while the actual mixing was done by a small air motor attached to the grout machine. Although the work could have been done with a smaller compressor, the availability of a large volume of air insured against any delay due to lack of air, which might have happened with a smaller unit.

In order to regulate the pressure used, a gauge was installed between the grouter and the compressor, and a relief valve placed in the line. It was the duty of the operator to regulate the pressure of the air in the grout machine by operating the relief valve, thus enabling us to maintain a constant pressure at all times. This relief valve is very important; after working a few hours without one, work was discontinued until one was installed.

The consistency of the mix varied from 10 gallons of water per bag of cement to as high as 40 gallons per bag; a high water content being used for portions of the hole which the pressure tests previously had shown to be tight. If, after putting several batches through in from one and one-half to two minutes, there was no indications of the time per batch increasing, the water content was decreased. Pumping of grout would then be continued until refusal for a period of from ten to twenty minutes, after which the pipes were drawn up and grouting continued in the next section.

Cement and water only were used in all cases, except one hole in which the fissures were so large that we were unable to build up any pressure. In this case we introduced sand for a number of batches, after which we ceased pumping until the next day, when pumping was resumed and the fissures finally blocked.

The air pressure carried varied from 10 to 45 pounds, depending on the size of the fissures encountered. Where very loose conditions were encountered, a pressure of 10 pounds would use a batch in from one and one-half to two minutes. If, after running several batches through, there was no appreciable signs of slowing, a thicker grout was used and the pressure was increased in order to overcome the greater resistance and fill the fissures thoroughly. In several cases we were compelled to cease grouting operations until the next day, as grout was appearing in a spring located about three hundred feet below the reservoir; also at several places grout appeared at the toe of the slope near the spillway. One such hole was worked thus for three days, the last day's work proving successful. In this particular hole we introduced sand as stated previously. The flow from the spring was partially sealed by our operation.

Following is a description of a typical hole as taken from field notes on pumping tests and grouting operations.

Pumping Test—Hole No. 72—Sta. 7+60. Depth of core hole, 38 ft. 7 in. Length of grout pipe 20 ft. 9 in. Total depth, 59 ft. 4 in.

Depth of Packers	*Air Pressure*	*Gal. per Minute*
55 ft. 4 in. to 58 ft. 4 in.....	45 lb.	¼ gal.
52 ft. 4 in. to 55 ft. 4 in.....	45 lb.	¼ gal.
49 ft. 4 in. to 52 ft. 4 in.....	45 lb.	¼ gal.
46 ft. 4 in. to 49 ft. 4 in.....	45 lb.	½ gal.
43 ft. 4 in. to 46 ft. 4 in.....	45 lb.	½ gal.
40 ft. 4 in. to 43 ft. 4 in.....	45 lb.	½ gal.
37 ft. 4 in. to 40 ft. 4 in.....	45 lb.	½ gal.
34 ft. 4 in. to 37 ft. 4 in.....	45 lb.	½ gal.
31 ft. 4 in. to 34 ft. 4 in.....	45 lb.	1 gal.
28 ft. 4 in. to 31 ft. 4 in.....	45 lb.	½ gal.
25 ft. 4 in. to 28 ft. 4 in.....	45 lb.	½ gal.
22 ft. 4 in. to 25 ft. 4 in.....	45 lb.	10 gal.
19 ft. 4 in. to 22 ft. 4 in.....	45 lb.	12 gal.

An examination of the above pumping record discloses that the rock in this hole is comparatively tight with the exception of about five feet directly below the bottom of the grout pipe. Accordingly, grouting was started with the packer at a point 45 feet below the top of the grout pipe, with a mixture of 1 to 20, and a pressure of 40 #, which was maintained for a period of twenty minutes. As it refused to take the batch for the length of this period, the packer was drawn up to a point twenty-seven feet below the top of the grout pipe, and grouting continued with the same pressure. At the end of twenty minutes, the rock not having taken any grout, the packer was drawn up to twenty feet, which point is at the bottom of the grout pipe. At this point the record shows the batch going through in one and one-half minutes. This continued until the eleventh batch, at which point cement appeared in a spring in the side of the hill at a point about 300 feet below the dam. The mixture was then thickened to 1 to 15 and grouting continued. The next twenty-four batches went through at the rate of a batch per one and one-fourth minutes, and a pressure of 30 lbs. At this point the time per batch began to lengthen, increasing with each batch for the next seven batches, the last one requiring eight and one-half minutes. The next batch refused for the next twenty minutes under the same pressure, indicating that the hole was plugged. This hole required the use of 43 bags of cement.

In grouting below the spillway floor, the sides of the grout pipes were thoroughly perforated in order that grout could be forced into the earth embankment below the floor; since settlement had occurred in several places under this floor.

The progress was necessarily slow, as it takes considerable time to assemble the pipes and place the packers at all points needed for making the tests. It was our practice to run a pumping test on several holes, then follow up with the grouting; thus keeping several holes ahead of the grouting operation. This enabled us to study the results of the pumping tests, and also decide on the places where we should place our packers. Progress was delayed somewhat by cold weather, as the work was continued through the winter.

The lineal footage of core holes drilled totaled 1,180, and the amount of cement used, 812 bags.

The results of the grouting were very satisfactory, and practically all of the leakage was cut off.

At Los Angeles, Calif., serious beach pollution has resulted in the proposal of a sewer service charge approximating $3.60 per water service per year. War restrictions will prevent the construction of sewage treatment facilities, but there is a possibility that temporary repairs will be made to sewer trunk lines and ocean outfalls in the near future.

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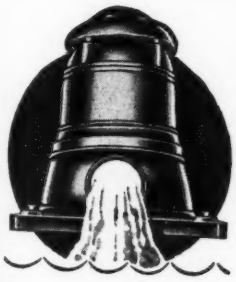

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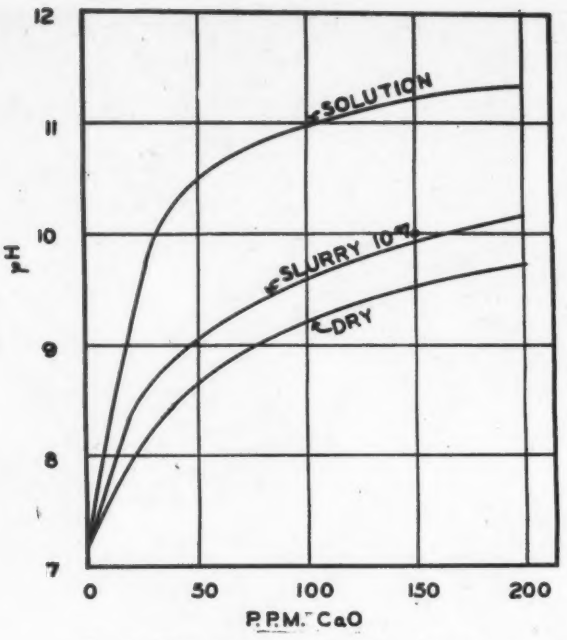

Fig. 1—Effect of lime on the pH value of sewage.

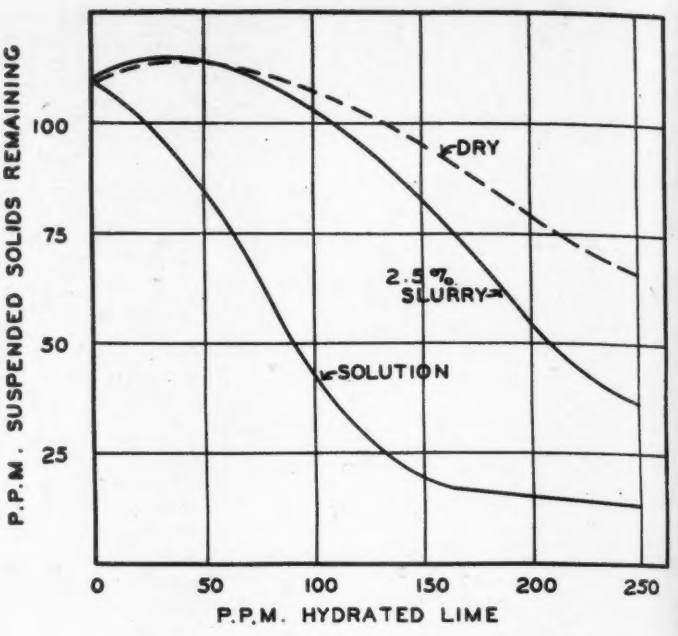

Fig. 2—Clarification of settled sewage with different methods of adding lime.

Two-Step Lime Addition for Sewage Coagulation and pH Control

By WILLEM RUDOLFS and G. B. NICKOL

Chief and Assistant, Dept. Water and Sewage Research, New Brunswick, New Jersey

Lime in solution is better for reaction control and sewage clarification than lime slurry or dry lime. Using part of the sewage to make the solution (two-step) recommended.

THE effect of lime in sewage clarification varies with the type of lime, the concentration of lime and the strength of sewage. The effectiveness of lime for supernatant digester liquor is greatly enhanced when in solution. The same holds when lime is used for pH control in digesters.

Various factors affect the use of lime, and the manner of addition is among those most important from an operation standpoint.* Dry lime feeders are frequently used for coagulation and sludge dewatering purposes, whereas for pH control in digesters, slurries are mostly used.

1. *Effect on pH Changes.* The effect of lime on the pH values of sewage varies with the amount of lime in solution. Only a fraction of lime in solution is required to raise the pH values to a given point as compared with dry lime. To obtain the same results, about one quarter less lime is required with a slurry of 10% than with dry lime. This is illustrated in Fig. 1, where the average pH values of four different sewages is plotted against the amounts of lime necessary. To raise the pH values to 10.5 at least four times more lime as a slurry must be applied than lime solution. Obviously, the more lime in solution the better the results.

*Rudolfs and Maggio, *Public Works*, January, 1943.

2. *Effect on Clarification.* The *method* of adding lime greatly affects the rate and degree of clarification. This is illustrated in Fig. 2, where the average results of four different types of sewages are shown. With 75 ppm hydrated lime in solution, the same degree of suspended solids removal was obtained as with about 175 ppm of hydrated lime applied in a 2.5 per cent slurry, and 250 ppm dry hydrated lime. The rate of clarification with lime in solution is about twice as fast as with lime slurry and about three times faster as with dry lime.

3. *Type of Lime.* The *type* of lime used also is a factor. Some results obtained on the clarification of sewage with calcium hydrate, dolometic hydrate and quicklime added dry and as a 10% slurry are shown in Table I. Small quantities of all lime slurries added cause increases in the suspended solids remaining. Addition of dry quick lime produces poor results, due to its tendency to form into small balls which settle and fail to dissolve. Since calcium hydroxide is more soluble than magnesium hydroxide, it can be expected that calcium lime is more effective than dolometic lime. Calcium hydrate, either as a slurry or dry, was most effective, but in all cases the slurries showed better results than the dry material. The results are in accord

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with general practice, showing that milk of lime or a slurry is preferable to dry lime addition.

TABLE I

Clarification of Sewage With Different Limes Added Dry and as a 10% Slurry

(Expressed in ppm. suspended solids removing)

Lime Added As CaO-MgO	*0*	*50*	*75*	*100*	*150*	*200*
Calcium hydrate						
Dry	101	105	106	105	61	57
Slurry	101	123	110	85	56	45
Dolometic hydrate						
Dry	102	108	109	113	103	79
Slurry	102	115	114	123	93	84
Ca quick lime						
Dry	101	103	106	119	120	110
Slurry	101	120	113	97	62	59

4. *Two-Step Addition.* Lime in solution produces the best results in pH control and clarification, but rather large amounts of water are required. The possibility of bringing most of the lime in solution in the smallest amount of sewage and adding this to the sewage flow was considered as a practical method.

The procedure followed was to add calculated amounts of dry lime to portions of sewage samples, stirring rapidly for 30 seconds and then adding the remainder of the samples for coagulation. A comparison of some results (Table II) shows clearly that using

TABLE II

Two-Step Addition of Lime

(Results expressed in ppm. suspended solids remaining)

CaO Added	*Method of Addition*	*Suspended solids ppm.*
150	Saturated solution	20
150	2.5% slurry	38
150	Dry in 7.5% sewage	35
150	Dry in 10% sewage	26
150	Dry in 15% sewage	52
150	Dry in 20% sewage	64
150	Dry in 30% sewage	82
150	Dry in 40% sewage	82
150	Dry in 100% sewage	90

about 10 per cent of the sewage to be coagulated produced best results and was approximately equally as effective as a saturated lime solution. This quantity of sewage was sufficient to nearly dissolve the lime. When larger or smaller volumes of sewage were used for the initial steps, less clarification was obtained. The explanation seems to be as follows: When the lime was added to 10% of the sewage, a certain amount of lime was tied up as calcium carbonate, but there remained a large amount of lime which was free to dissolve. The dissolved lime was effective in clarification, but when more or less sewage was added than the optimum amount, results approached those obtained with dry lime or a slurry.

The effect of two-step lime addition was determined on four different sewages. The quantities of lime required for optimum clarification with the two-step method was determined, and for comparison the same amounts of lime were added dry. The average results for these sewages are given in Table III.

It is clear that in all cases where the optimum quantity of sewage was used for the initial step, better clarification was obtained than when dry lime was added. Comparing the averages of these sewages, containing 105 ppm suspended solids after pre-settling for two hours, the dry addition removed only about 30 per cent of the suspended solids, whereas the two-step method removed about 75 per cent.

The method employed is not new in the sense that milk of lime additions are better for clarification than

TABLE III

Clarification by Two-Step and Dry Addition of Lime

Method of Addition	*Source of Sewage*	*ppm. CaO Added*	*Susp. Sol. Remaining ppm.*
Dry	Plainfield	200	114
Two-step	Plainfield	200	48
Dry	Sayreville	200	68
Two-step	Sayreville	200	17
Dry	South River	200	47
Two-step	South River	200	18
Dry	Freehold	150	62
Two-step	Freehold	150	21

dry lime additions. Water or sewage effluents have been used to slake lime and to prevent the slaked lime from settling out. This led to the practice of making batches of milk of lime in advance for use and is now practiced in a modified form at many plants by dumping hydrated lime in a container and letting a stream of water pass through with occasional stirring. The experiments described show that maximum results for reaction control and clarification may be obtained with minimum amounts of lime and optimum quantities of sewage to dissolve the lime.

Summary

Experiments have shown that lime in solution is better for reaction control and sewage clarification than lime slurry, and that lime slurry is better than dry lime addition. The best type of lime to be used for these purposes is high calcium hydrate. Adding dry lime to a portion of the sewage and stirring rapidly for 30 seconds and then adding the mixture (two-steps) produced results approximately equal to the addition of lime solution. This method saves lime and results in quicker and better clarification or pH control.

The above, written for PUBLIC WORKS, is the fourth Journal Series Paper of the New Jersey Agricultural Experiment Station, Rutgers University, Dept. of Water and Sewage Research, New Brunswick, N. J., dealing with the use of lime in sewage treatment.

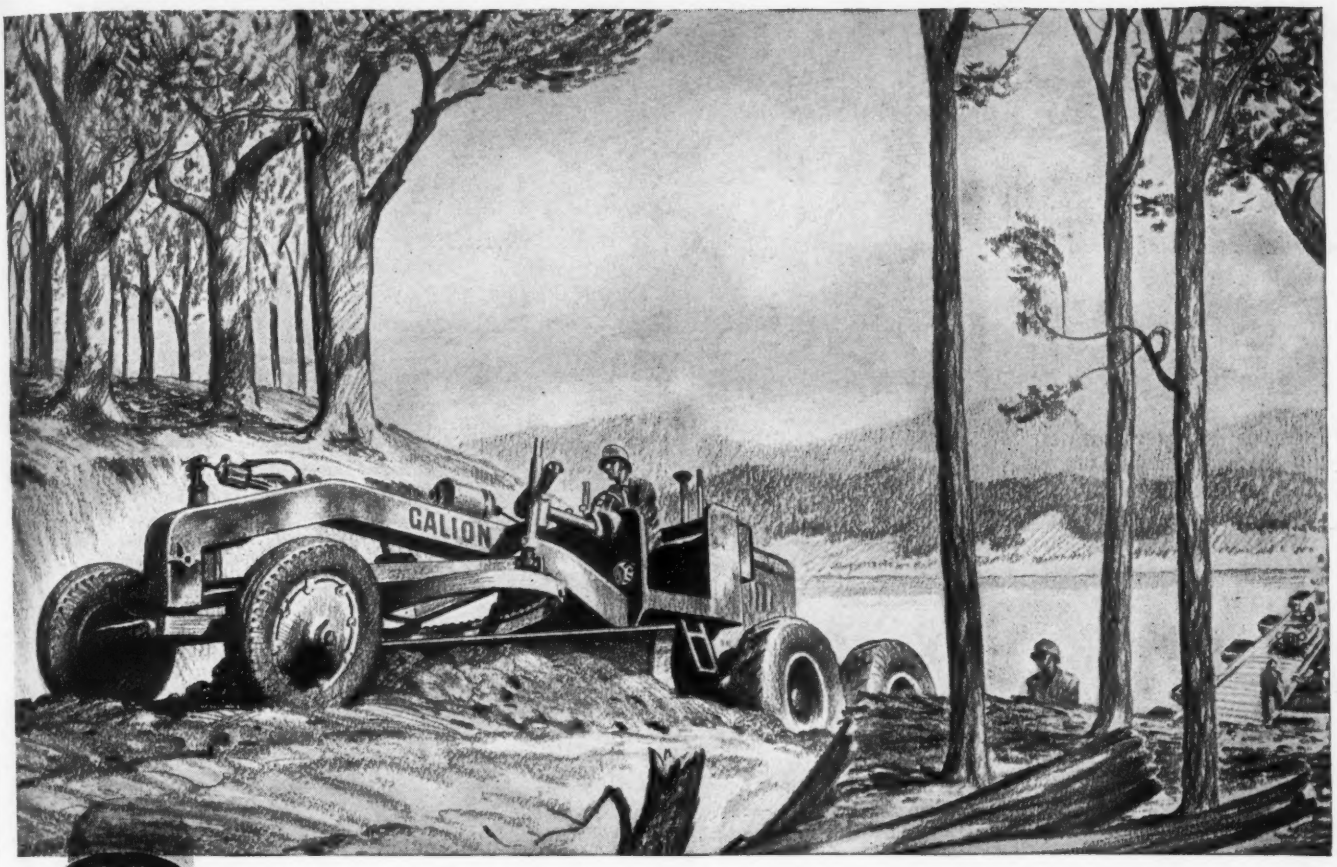
The work recorded in this paper was performed under a Fellowship grant of the National Lime Association.

Building a Soil-Cement Road in Kenosha County

(Continued from page 15)

rolling was carried on to within two inches of the top, thus leaving sufficient material for the light blading

At the conclusion of the sheepsfoot rolling, the section was bladed lightly to overcome any minor grade defects. This particular soil-cement project called for an enriched or "sweetened" top, and at the conclusion of the light blading three per cent additional cement was spread over the surface by means of a lime spreader, and was mixed into the surface to a depth of two inches by the Seaman mixers set to that shallow depth. It was found necessary to make an additional light application of water done during this mixing operation in order to maintain the optimum moisture content. Working at this shallow depth, two passes with the mixer were sufficient. At the conclusion of this mixing operation, it was rolled with a pneumatic roller. The compaction planes set up by this rolling operation were removed by use of a nail drag in combination with a broom drag—the nail drag removing the compaction planes and the broom drag smoothing the surface to secure better riding qualities.



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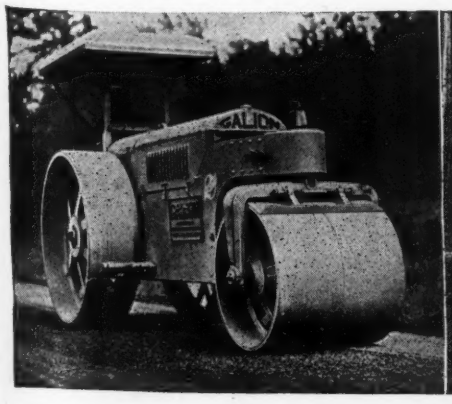


As the final finishing operation, the surface was smooth-rolled with a solid-wheel roller of approximately five tons weight. This left a smooth surface without ridges. The following day the section was lightly sprinkled with water, covered with curing paper, and allowed to cure for one week, after which time it was opened to traffic.

This is the only section of soil-cement we have in our county, but it has gone through two winters now and has proven very satisfactory.

The following is a list of the equipment used on this project, all of which was owned by the contractor:

1 Power-driven motor grader equipped with scarifier (Austin-Western). 1 Twenty-four-inch offset disc. 1 Spring-tooth cultivator equipped with depth control device. 1 Pneumatic wheel tractor. 3 Thirty-five horse-power crawler tractors equipped with power take-offs. 2 Seaman Pulvi-mixers to operate from the power take-off of tractors. 2 One thousand gallon asphalt distributors (Guninson). 1 Sheepsfoot roller. 1 Pneumatic roller. 1 Nail and broom drag combined. 3 Four-ton trucks for cement hauling. 1 Smooth wheel roller (five-ton tandem).

The first day's processing was 950 feet of 20-foot pavement, the second day's was 1,500 feet and the third day's was 2,800 feet, which completed our mile. This work was done under the supervision of Howard F. Herzog.

The contract cost of the work was $4,248.19. The county furnished the cement, which cost $2,523.91. Other miscellaneous cost for county labor, demurrage etc. came to $710.35, making the total cost $7,482.45.

Pre-Cast Concrete Curb in Lee, Mass.

(Continued from page 26)

the mixer drum, and 2 floating, 20 blocks were poured in less than one hour. End blocks for street intersections and driveways were beveled at one end by placing a 1″ x 6″ board as shown in the sketch.

After allowing the concrete to set for a few hours, the outside edges were pressed with a flat trowel to permit removing the forms sooner. If bright, hot sun was shining, the blocks were covered with burlap and wet down. On the third day two men removed the forms, cleaned them, coated them with oil, and prepared them for another pouring. Three men rolled the blocks off the table and two rubbed down the face and top. With good weather, five pours—500 feet of curb—could be completed in two weeks.

After setting two more days the blocks were carried to the street, where the ditch had been dug and 3″ of gravel base placed and tamped to grade. The blocks were placed on this to line and grade leaving 7″ of face exposed above the street surface; a piece of 1″ x 6″ x 8″ board being placed under each joint to prevent the joints settling unevenly. Black sheathing paper folded three times was placed in each joint to provide for expansion. Backfilling was tamped carefully along the road edge to prevent eventual tipping of the curb, and back of the curb was filled level to the top and tamped securely for 6″ from the top. For lowering the blocks into place we used our Austin-Western 99 grader, extending a flat ½″ x 4″ bar 4 ft. long from the end of the mold board and using a rope sling.

Approximately 360 blocks were poured with very little harm to the forms, which could have been used for as many more. The approximate cost was: Material for forms, less ties (which we had in stock for cribbing), $36. Initial form construction and leveling, $10. Complete cost per pour for removing blocks, resetting forms, transportation to job and setting curb, $59; or approximately $2.90 per block made and set in place. Approximate cost for construction of blocks alone, including depreciation on forms, cost of material and labor, $1.00 per block.

We find this type of curbing, though not everlasting, is inexpensive, easily replaced and very satisfactory.

Precision in Batching Concrete

(Continued from page 22)

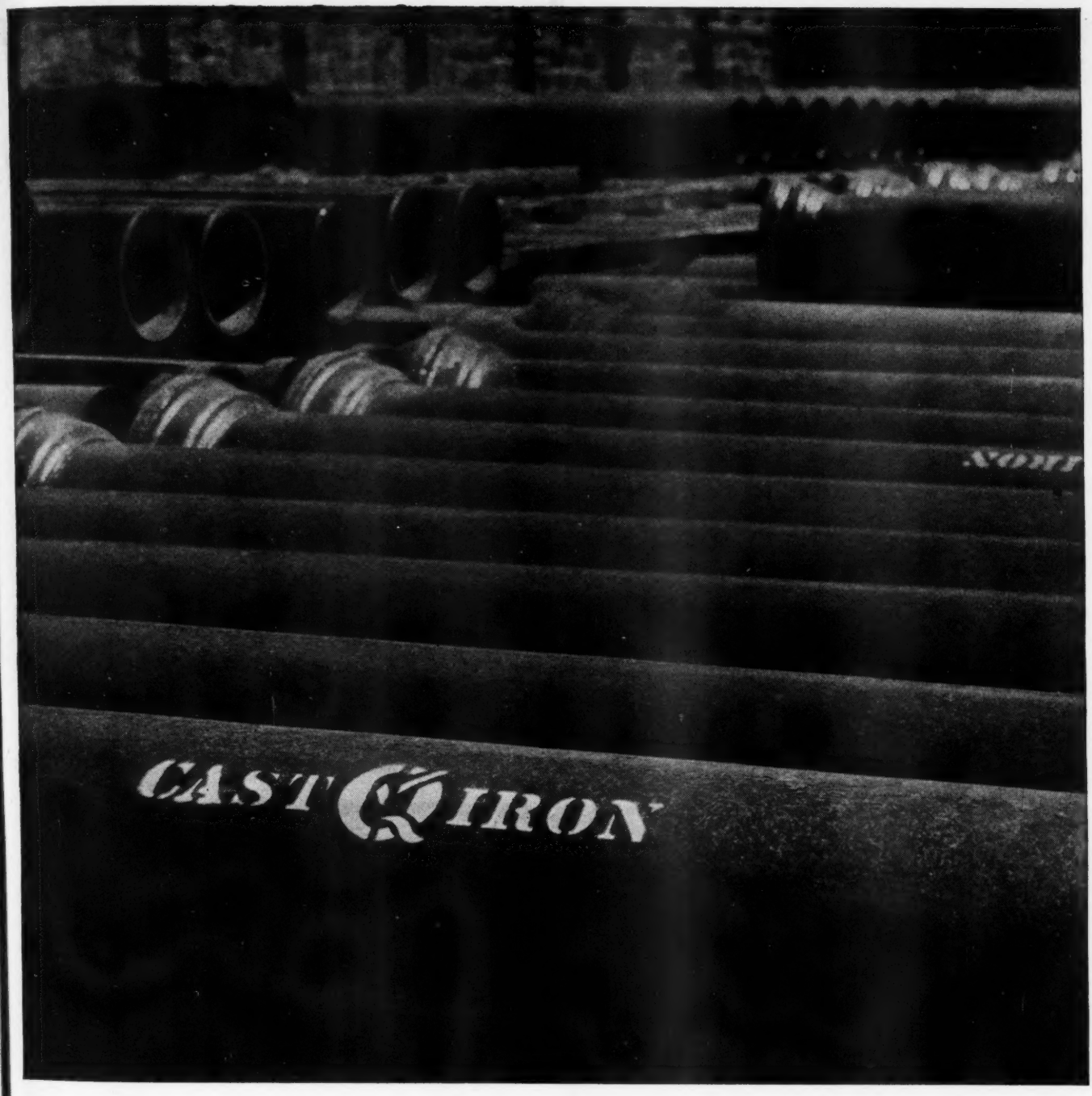
the sand and gravel being used in a given batch contained 45 lb. of water, then by adding 255 lb. of water, 1,336 lb. of sand including its water and 1,969 lb. of gravel including its water, the mix would have had just the strength desired.

If the designer should not allow for water content of aggregates the results might be even more serious, for he would, in the above case, obtain only 2,000 lb. concrete although his design was based on 2,500 lb. strength.

In plants making high-grade concrete, it is customary to determine the moisture content of each delivery of sand and of stone, or even to make such determinations once every day; but rain or drying winds may easily change this 2% or even much more in a few hours. An ideal procedure would be to make moisture determinations for each batch. But a standard field determination requires 20 to 30 minutes, so this appears to be impracticable. However, a method has been developed (called $(SC)^2$ Precision Control) which does this mechanically for each batch and so controls the feed of sand and gravel as to allow for their actual water content, and regulates the amount of water added accordingly.

In this method, the specific gravity of the sand and that of the gravel are determined and form the basis. So long as the sand and gravel continue to come from the same sources, their specific gravities usually remain fairly constant, but should be checked occasionally. These determinations should be made by a trained technician, but all the others can be made by any intelligent weighman, since a set of scales with special poises, discs, and beam graduations does the necessary calculating.

A Toledo moisture meter scale permits ascertaining the moisture content of an aggregate, correct to ¼%, in less than a minute. In using it to determine the specific gravities, two lbs. of a saturated surface dry sample is weighed into a cup which is machined to hold exactly two lbs. of water. (Four-lb. cups are also available for larger samples and greater accuracy.) The cup is then partly filled with water and shaken to remove all of the entrained air, then completely filled and replaced on the scale, which then reads the specific gravity directly. Figure 2 shows the dial of this scale (which is 24″ in diameter); the specific gravity segments can be seen near 70 lbs. and 110 lbs. on the outer circle of figures. These outer figures are used with the scale platform, and the inner row of figures with the auxiliary knife-edge from which the cup is suspended. After the specific gravities of sand and stone have been determined, they are set on the "weight-of-sample" segments (shown opposite 40 lbs.



2. Delivery now

—for essential improvements. With war construction requiring cast iron pipe well past the peak, the storage yards of our members are amply stocked with pipe ready for immediate delivery. Any requirements not available from stock can be quickly produced. You need not experiment with substitute materials. Cast iron pipe is available right now. Tell our members your service requirements and trench conditions and they will tell you how to specify.

3. Postwar planners

—can safely specify cast iron pipe since quick deliveries after the War can be counted on. Plans made now will mean jobs ready then —plans in detail, ready for proposals.

CAST IRON PIPE
RESEARCH ASSOCIATION, CHICAGO
CAST IRON
NO. 1 TAX SAVER

When you need special information—consult the classified READER'S SERVICE DEPT., *pages 65-67*

and 80 lbs. on the outer circle), using movable hair-line targets for that purpose.

To determine the per cent of water in a sample, run material from this sample into the same cup until the scale pointer is over the hair-line specific-gravity target; fill the cup with water as before, and then the proper segment gives directly the amount of water as per cent of dry weight. (The two-pound cup is usually used for sand and the four-pound cup for stone.) This moisture-meter unit is also a precision laboratory scale, accurate to 1/100 lb., which can be used for sieve analyses, unit weight determinations, etc. The moisture determinations should be made at short intervals, in some cases for nearly every batch, depending on weather conditions, importance of precision, etc.

Another feature of the method is the batching scale, which automatically adjusts the mixes for varying water content of the aggregates. (See Fig. 3.) It contains a scale beam for each ingredient, each with a sliding poise. To each of the aggregate poises can be attached discs, which are calibrated in per cent of poise weight to the nearest ¼%. Let us assume that a batch is to be run proportioned as in the example already used—1,310 lb. of sand, 1,950 lb. of gravel, 300 lb. of water and 455 lb. of cement; and that the sand, just tested, has been found to contain 2% moisture and the gravel 1%. Then we set the sand poise at 1,310 on its scale beam and attach a 2% disc, then run the sand into the weigh hopper until the scale is in balance, when the flow of sand is automatically cut off. The weigh hopper then contains 1,310 lb. of sand, plus 2% (26 lb.) to balance the disc, which is the contained moisture. The gravel poise is then set at 1,950 lbs., a 1% disc attached, and 1,950 lb. of gravel plus 19.5 lb. of moisture run into the hopper. The discs are then removed and the poise on the water scale beam set at 300. The three poises now represent 1,310 + 1,950 + 300 lb. = 3,560 lb.; and the weigh hopper contains 1,336 + 1,969.5 lb. = 3,305.5, and to bring the scale to balance requires 254 lb. of water, which gives the 300 lb. when added to the water in the sand and gravel. The 455 lb. of cement is weighed normally, no allowance for moisture being needed.

A dial scale is attached, with a pointer so connected that when any poise is moved away from its zero position, the pointer follows and shows the poise setting. As material is run into the weigh hopper the pointer travels backward until it reaches zero, indicating scale balance, when the flow of material is stopped. This method of "backweighing" enables an accurate automatic cut-off to be built into the scale, since the cut-off is always at the same place—zero. This cut-off is operated by two mercury-magnetic switches, the first of which reduces the flow of material to a "dribble" when the loading is nearly completed and the second actuates the final cut-off. This enables rapid loading to be combined with accuracy. Automatic cut-off is always used for cement and water and is optional for aggregates. If cutting off for the latter is done by hand, the operator watches the hand on the scale and cuts off as it reaches zero. It is said that this procedure gives weights of dry aggregates within a tolerance of ¼% and water with a tolerance of ½ gal. per cu. yd. No calculating is necessary; the entire operation can be performed by any intelligent weighman in less time than it takes to describe it.

In dry batching the process is exactly the same except that the added water is not delivered at the batching plant. The amount of water to be added is noted from the dial reading, written on the batch ticket and delivered at the mixer, giving the same accuracy of control.

An added feature is a graphic recorder which records the weight of each ingredient in every batch and the time of batching. If a time stamp is used on the batch tickets, any particular batch can be positively identified on the graphic record. This recorder, which can be locked, makes continual inspection of weighing operations unnecessary, a feature which inspecting engineers will appreciate.

To adapt an existing plant to this system, the old scales are replaced with new ones with a more accurate lever system than is generally used, and a water tank is added to the weigh hopper, with pipes for supplying the water.

The Scientific Concrete Service Corporation, which leases the equipment for this $(SC)^2$ Control, states that it was used on the Pentagon Building, Washington, and the Dodge Brothers Factory in Chicago and is in use at a number of important construction projects and ready-mix plants.

Postwar Expenditures Planned by Cities

INFORMATION has been collected by PUBLIC WORKS from city engineers concerning expenditures planned by United States cities for postwar work, by means of a questionnaire which has been answered by 659 cities. More are yet to be heard from. It is to be borne in mind that this work is already definitely planned or being planned when the questionnaires were sent out; undoubtedly more is being planned now or is contemplated.

Of the 659 cities, 414 have plans for sewerage and sewage disposal estimated to cost $274,218,000; 287 plan to spend $48,487,000 on water supply; 411 to spend $257,550,000 on paving, grade crossing elimination, etc. (this is for cities only; county and state work is not included); and 68 expect to spend $103,330,000 on airports.

In addition to these, plans have been or are being prepared to spend an estimated $112,995,167 on parks, flood control, lighting, recreation facilities, public buildings, harbors, bridges and other municipal public

Estimated Cost of Postwar Work by Municipalities for Which Plans Have Been or Are Being Prepared

Alabama	$ 4,000,000	Montana	4,233,439
Arizona	4,150,000	Nebraska	547,000
Arkansas	78,500	Nevada	70,000
California	39,817,015	New Jersey	14,049,495
Colorado	13,114,100	New York	313,189,905
Connecticut	4,990,000	North Carolina	3,485,000
Florida	41,396,048	North Dakota	2,451,997
Georgia	1,378,000	Ohio	132,499,924
Idaho	2,712,000	Oklahoma	3,710,000
Illinois	24,001,890	Oregon	1,637,272
Indiana	11,396,500	Pennsylvania	25,175,000
Iowa	5,147,970	South Carolina	6,429,923
Kansas	1,934,200	South Dakota	650,000
Kentucky	2,438,828	Tennessee	12,608,000
Louisiana	1,030,000	Texas	17,769,000
Maine	2,725,000	Utah	212,231
Maryland	2,325,000	Vermont	60,000
Massachusetts	4,312,100	Virginia	5,554,000
Michigan	28,059,750	Washington	14,541,000
Minnesota	10,015,260	Wisconsin	20,699,500
Mississippi	2,421,970		
Missouri	8,393,350	Total	$795,410,167

7 things you should do to keep prices down!

If prices soar, this war will last longer, and we could all go broke when it's over. Uncle Sam is fighting hard to keep prices *down*. But he can't do it alone. It's up to *you* to battle against any and every rising price! To help win the war and keep it from being a hollow victory afterward—you must *keep prices down*. And here's how you can do it:

1. BUY ONLY WHAT YOU NEED

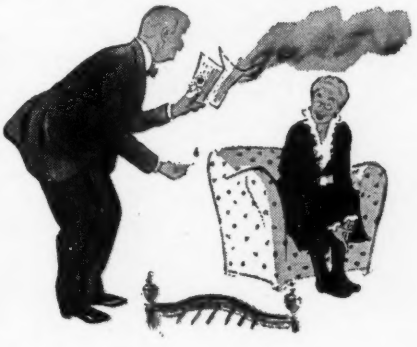
Don't buy a *thing* unless you *cannot* get along without it. Spending can't create more goods. It makes them scarce and prices go up. So make everything you own last longer. "Use it up, wear it out, make it do, or do without."

2. PAY NO MORE THAN CEILING PRICES

If you do pay more, you're party to a black market that boosts prices. And if prices go up through the ceiling, your money will be worth less. Buy rationed goods only with stamps.

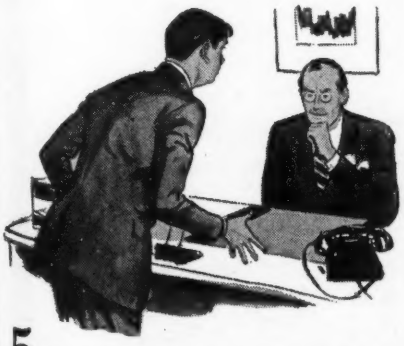
3. SUPPORT HIGHER TAXES

It's easier and cheaper to pay for the war as you go. And it's better to pay big taxes *now*—while you have the extra money to do it. Every dollar put into taxes means a dollar less to bid for scarce goods and boost prices.



4. PAY OFF OLD DEBTS

Paid-off debts make you independent now . . . and make your position a whale of a lot safer against the day you may be earning less. So pay off every cent you owe—and avoid making new debts as you'd avoid heiling Hitler!

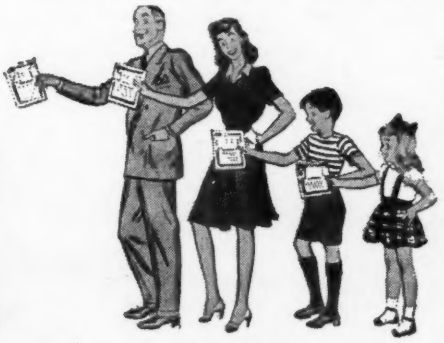


5. DON'T ASK MORE MONEY

in wages, or in prices for goods you have to sell. That puts prices up for the things all of us buy. We're all in this war together—business men, farmers and workers. Increases come out of everybody's pocket—including *yours*.

6. SAVE FOR THE FUTURE

Money in the savings bank will come in handy for emergencies. And money in life insurance protects your family, protects you in old age. See that you're ready to meet any situation.



7. BUY WAR BONDS

and hold them. Buy as many as you can. Then cut corners to buy more. Bonds put money to work fighting the war instead of letting it shove up prices. They mean safety for you tomorrow. And they'll help keep prices down today.

KEEP PRICES DOWN . . .

Use it up . . . Wear it out . . .

Make it do . . . Or do without.

This advertisement, prepared by the War Advertising Council, is contributed by this magazine in cooperation with the Magazine Publishers of America.

When you need special information—consult the classified READER'S SERVICE DEPT., *pages 65-67*

works. This brings the total to $795,410,167. In quite a number of cases — approximately 10% — the estimated cost was not reported and these are not included in our figures. A number of the largest cities—Los Angeles, Chicago, Boston, Detroit, St. Louis, Philadelphia—did not report. If these were included it seems certain that the total would run to over a billion dollars.

The estimates reported have been totaled by states, and these state totals are given in the accompanying table.

A 160 MGD Pumping Plant Installed in Eight Weeks

Within the past two or three months a beginning has been made of giving improved water service to a dozen communities along the northern rim of the Detroit area in which are located nearly 100 war industries, including Chrysler Tank, General Motors Diesel, Vickers, Republic Steel and many key parts plants.

The Office of War Utilities found, early this year, that demands for water in these communities had grown to such an extent that a critical condition threatened this summer unless immediate action were taken. The difficulty was not inadequate water supply at the source, but inadequate pressure or size of mains to deliver it to the various plants.

Both lack of material and need for haste seemed to make it impracticable to lay sufficient mileage of large pipes to solve the problem, but the OWU hit upon another solution. Located in Highland Park, a suburb within Detroit but much closer to the war plant communities than the main Detroit pumping stations, was a 40-million gallon reservoir being used for standby or reserve. Large water mains of the Detroit system passed close by, and it was planned to connect the mains with the reservoir, thus filling the latter at night from the Detroit supply, and pump from the reservoir to the war plant communities during the daytime peak demands.

This plan involved obtaining the consent of the City of Highland Park for this use of its reservoir; and that city agreed to rent it to the government, and Detroit agreed to furnish Highland Park with the necessary standby service. It also involved obtaining pumps of adequate capacity, which problem was solved when the City of Philadelphia agreed to lend four new 40 mgd pumps which were being completed for its own water system.

FWA agreed to finance and construct the project. Suppliers of equipment cooperated fully. The War Manpower Commission, U. S. Employment Service and labor unions furnished the labor necessary for doing a rush job; with the result that a project that normally would have required at least six months to complete, was built and began operating in eight weeks. One of the 40 mgd pumps went into operation July 20th; the others will supplement it when necessary.

Compensation for Unforeseen Conditions

The general rule is that a promise to do, or actually doing, that which a party to a contract is already under obligation to do, is not a valid consideration to support the promise of the other party to the contract to pay additional compensation for such performance.

But there is an exception to this rule, recognized in the Restatement of the Law of Contracts, Section 76, relating to unforeseen difficulties in the performance of the contract. This is, that where the party refusing to complete his contract does so because of some unforeseen and substantial difficulties in the performance of the contract, which were not known or anticipated by the parties when the contract was entered into, and which cast upon him an additional burden not contemplated by the parties, and the opposite party promises him extra pay or benefits if he will complete his contract, and he does so, the promise to pay is supported by a valid consideration.

This has been so held in Maryland (Linz v. Schuck, 1907, 106 Md. 220, 288, 67 Atl. 286) and the exception to the rule was applied recently in an action by the United States for the use of a subcontractor on a public works contract with the government against the contractor and another. Lange v. United States, for use of Wilkinson, Fourth Circuit Court of Appeals, 120 F., 2d 886, affirming 35 F. Supp. 17.

A Covered Reservoir Without Reinforcement

A 6,000,000-gallon filtered water reservoir has been constructed by the Federal Works Agency on Minor Hill in Arlington County, Va., which, although covered, contains no reinforcement or other steel. The walls are of mass concrete, gravity section. The roof is constructed with wood trusses supported by brick piers and covered with conventional tar and gravel roofing, protected against fire. This reservoir is fed from the District of Columbia Dalecarlia plant and serves the southwesterly part of the county.

Photograph by courtesy of Federal Works Agency.

Your Bond Selling Responsibilities Double!

Starting September 9th, your Government will conduct the greatest drive for dollars from individuals in the history of the world—the 3rd War Loan.

This money, to finance the invasion phase of the war, must come in large part from individuals on payrolls.

Right here's where YOUR bond selling responsibilities DOUBLE!

For this extra money must be raised *in addition* to keeping the already established Pay Roll Allotment Plan steadily climbing. At the same time, every individual on Pay Roll Allotment must be urged to dig deep into his pocket to buy *extra* bonds, in order to play his full part in the 3rd War Loan!

Your now *doubled duties* call for these two steps:

1. If you are in charge of your Pay Roll Plan, check up on it at once—or see that whoever is in charge, does so. See that it is hitting on all cylinders—*and keep it climbing!* Sharply increased Pay Roll percentages are the best warranty of sufficient post war purchasing power to keep the nation's plants (*and yours*) busy.

2. In the 3rd War Loan, every individual on the Pay Roll Plan will be asked to put an *extra two weeks salary* into War Bonds—over and above his regular allotment. Appoint yourself as one of the salesmen—and see that this sales force has every opportunity to do a real selling job. The sale of these *extra* bonds cuts the inflationary gap and builds added post-war purchasing power.

Financing this war is a tremendous task—but 130,000,000 Americans are going to see it through 100%! This is their own best *individual* opportunity to share in winning the war. The more frequently and more intelligently this sales story is told, the better the average citizen can be made to understand the wisdom of turning every available loose dollar into the finest and safest investment in the world—United States War Bonds.

★ ★ ★

BACK THE ATTACK With War Bonds!

This space is a contribution to victory today and sound business tomorrow by PUBLIC WORKS *Magazine*

When you need special information—consult the classified READER'S SERVICE DEPT., pages 65-67

H-7-500-11-42

Commissioners Lower Merion Township
MONTGOMERY COUNTY, PA.
HIGHWAY DEPARTMENT

TRUCK DRIVER'S Monthly Report

Year 1943 Month March
Driver A. Guera

1943 Date	Speedo'm Reading	Gals. Gas	Quarts Oil	Special Purchases and Remarks	District	Loads Ashes	Hauled Trash
Mar. 2	13046	10	1				4 loads
3	070	12					3 "
4	100	12					3 "
5	137	13	12	Change oil, 2 lbs. 600W-Grease			3 "

COMMISSIONERS LOWER MERION TOWNSHIP
MONTGOMERY COUNTY, PA.
HIGHWAY DEPARTMENT

TRUCK EXPENDITURES

TRUCK NO. No.8
TYPE TRUCK Autocar
DRIVER Guera
ASSIGNED TO Jordon

1943 DATE	LABOR	FORE.	DRIVER	ITEMS AND WHERE PURCHASED	WAR-RANT	MISC.	GAS	TIRES	TOTAL
2-1			2.80	Repair chains					2.80
2-15				Autocar Co. 6 plugs, repair choke control	51608	4.74			4.74
2-28				" " adjust brake	51631	2.25			2.25

Maintenance of Public Works Equipment

By W. E. ROSENGARTEN
Township Engineer, Lower Merion Township, Ardmore, Penna.

Township keeps thirty-five pieces of equipment in first class repair, and records of mileage, cost, repairs, etc., for each piece.

TO properly maintain our highways, drains, sewers and other public improvements requires operations which of necessity are continuous; and since the equipment used in these operations is in service more or less continuously it has been considered both desirable and economical to own it rather than to rent. Accordingly the Township of Lower Merion owns and operates 14 trucks of 1½ to 3½ tons capacity, 2 gasoline road rollers, 1 small Diesel bulldozer, 2 motor sweepers, 2 motor mowers, 3 concrete mixers, 3 motor-driven water pumps, 1 compressor and 7 motor cars.

In general, each piece of equipment is assigned to an individual operator, who is held responsible for the routine care of it, such as cleaning, tightening bolts, etc.

A gasoline and oil service station is operated by the Township at the equipment garage, the attendant of which and his assistant are also in charge of the cement and tool storage house. In the office of the station is located a blackboard on which is listed all motor vehicles, and the mileage when the next lubrication of each is due. It is the duty of the attendant to check against the board the speedometer mileage shown on all gas slips and call for the equipment to be brought in for greasing when due. By this system of lubrication our equipment has given excellent service.

When repairs are necessary, the equipment is taken to one of several automobile repair shops in the Township, generally to the company from which the equipment was purchased since it is believed that they are most interested in keeping their equipment in the best possible working condition at the least maintenance cost. In normal times they would be interested in making a resale and know that this is possible only when their unit makes a good showing.

It is interesting to refer to our system of cost keeping records. The operator records daily the speedometer reading or the hours operated, the gas and oil used and the cost of repairs, and also the work done. These notations are made on a "Truck Driver's Monthly Report" card and turned into the office at the end of each month. A summary of the information for the year is compiled in the office on a "Truck Expenditures" card. This gives a total and a unit cost for the operation of each piece of equipment. A sample field card used by the operator and the summary card as used in the office, are shown herewith.

The old adage "A stitch in time saves nine," which has been a by-word in road maintenance work, is equally true in the case of equipment maintenance. We have made a special effort to keep all equipment in first class repair, as it is believed that only in this manner will it give a good account of itself.

The supervision of all equipment is under the direction of M. C. Burnley, Superintendent of Maintenance.

The War Emergency

(Continued from page 7)

works superintendent, superintendent of sewers, sewage plant operator, director of public works, private water utility engineer; and a representative of the Public Utility Commission (Water) and the Insurance or Underwriters Engineer.

In New England the existing committee of the NEWWA and the NESWA could function for all six states, possibly forming state sub-committees.

Conservation of Personnel

Maintenance of personnel in all municipal departments is daily growing more difficult, in spite of the fact that the War Manpower Commission includes in its list of essential services (as revised August 17) highway and street construction and repairs; electric light and power, water and gas utilities, sewage systems and water well drilling. For this list merely is offered to local draft boards as an aid in deciding whom not to draft; each board can use its own judgment. Harry E. Jordan, Secretary of AWWA, advises as follows: "Water works executives who are concerned over the possible loss of key men, men who hold positions listed in the "essential occupations" group of Bulletin 30, or even in the new "super" list, must make the fullest presentation of their case before the local draft board and had better emphasize just what the man's service means to the continuity of water supply and safety of the local community and of the very board members who are considering the case. You perhaps feel that you are being pushed around a bit by people who are more zealous than practical. Why not sit down a while with that senator or congressman of yours who is in his district now and who wants to know what you are thinking? He has been working hard and he too has been pushed around. He would in all likelihood like to ask you some questions and you in turn should wish to have his counsel in your problems.

"Water utilities continue to use less M.R.O. material than Order U-1 permits. This undesirable situation probably results partly from the desire of water utilities to use no materials not clearly necessary. Every water utility executive has been, through official statements made by officials of the Office of War Utilities, advised to maintain his property in full and adequate condition for service. They owe it to themselves and to the communities they serve to keep water systems in as good service condition as the pattern of Order U-1 permits. This is a serious matter and deserves the serious consideration of all water works superintendents and managers."

If you have copper tubing "in excess of practical working minimums as defined in Utilities Order U-1" you should sell your supplies at once to some water department which is understocked; otherwise the W.P.B. may (it announced in August) requisition it, paying for it 18 to 24 cts a pound—probably less than you paid for it.

Do You Get It, Or Don't You?

Under one paragraph of a July amendment to Limitation Order L-192, "nothing in this order shall prevent any person from placing or accepting an order for new equipment listed in Schedule D, subject to all ap-

that bridge of tomorrow can be **PLANNED** today

As a highway or municipal engineer you have a double responsibility. Not only will you want to make your plans to provide jobs for returning service men and war workers, but these plans must fit a postwar world, the pattern of which is not yet clear.

You can find a practical answer to your postwar bridge problems on both of these counts by specifying ARMCO Multi Plate Pipe and Arches. This way you get a strong, durable, basic structure that can be easily installed by unskilled labor. At the same time you assure a flexibility in design and appearance that will enable you to conform to postwar standards. With ARMCO Multi Plate to support the load you can finish the bridge with any type of design and material you choose.

Other advantages include ease of transportation, quick assembly on the job site without special equipment, and freedom from maintenance.

Include ARMCO Multi Plate in your postwar plans even though you may not be able to get it for your immediate construction needs. After the war it will again be available for bridges, stream enclosures, large sewers and special drainage structures. Write us for complete data. Armco Drainage Products Assn., 495 Curtis Street, Middletown, O.

MULTI ARMCO PLATE **ARMCO**

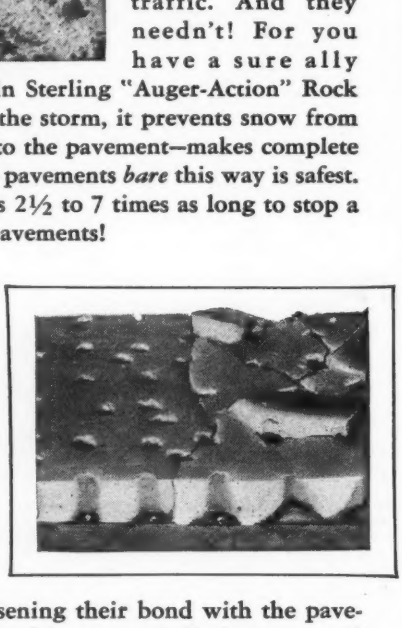
MULTI PLATE PIPE AND ARCHES

When writing, we will appreciate your mentioning **PUBLIC WORKS**

MR. ENGINEER!

STOP WINTER SABOTAGE OF VITAL TRAFFIC!

When Storms Strike in your area . . . they must not be allowed to tie up vital trucking of war supplies and other essential traffic. And they needn't! For you have a sure ally against snow and ice in Sterling "Auger-Action" Rock Salt. Applied early in the storm, it prevents snow from packing and bonding to the pavement—makes complete removal easy. Keeping pavements *bare* this way is safest. Tests show that it takes 2½ to 7 times as long to stop a car on ice as on bare pavements!



But What Happens if ice has already formed? Sterling "Auger-Action" Rock Salt is still your best bet. As the model here shows, it digs in fast. And forms a brine with the melting snow and ice, loosening their bond with the pavement. Thus loosened and honeycombed, the snow and ice can easily be removed by scraper and plow. Further, when straight Rock Salt is used, it eliminates the cost of cleaning streets and catch basins which ordinarily become clogged with sand and cinders during thaws!

Sterling

"Auger-Action" ROCK SALT

FOR ICE PREVENTION

Highway Departments have shown savings of ⅓ to ½ by using Sterling Salt for ice prevention. Write today for bulletin containing all the facts on the most efficient and economical solution to your snow and ice removal problems. Free consultation with an International Field Engineer upon request. International Salt Company, Inc., Scranton, Pa.

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plicable regulations of the War Production Board." Further on the amended order says: "The manufacture of items of equipment appearing in Schedule D will be discontinued." The items in this schedule are fine graders and subgraders, drawn type; under-truck type graders; joint levellers; carrying and hauling scrapers over 15 cu. yd. struck capacity, and drag, fresno and rotary scrapers.

Decreasing Practice of Assessing for Street Paving

On May 20th, 1943, Congress passed a bill relative to the paving of streets, in explaining which the Congressional committee reporting it said, in part:

"This bill recognizes that a roadway is primarily for the use of the general public. The bill, therefore, eliminates all assessments against abutting property for the construction of roadway improvements as distinguished from the construction of curbs and gutters. It retains the present plan of assessment for the cost of curbs and gutters with slight modifications to prevent inequities. Where a gutter is constructed as an integral portion of a permanent type of roadway, that portion of the roadway lying within 2 feet of the curb line is considered a gutter for the purposes of the act.

"In effect the bill shifts from the owners of abutting property to those paying gasoline taxes, registration fees, motor-vehicle permit fees, and other special taxes into the general highway fund of the District of Columbia, that portion of the cost of roadway improvements now paid for by assessments on abutting property.

"In the early days when roadways were constructed primarily as a means of ingress to and egress from abutting property, the assessment plan was appropriate. Today, however, when roadways are constructed primarily for the use of the general traffic, the assessment of a substantial part of the original cost of the roadway upon abutting property loses much, if not all, of the equity originally characteristic of it. Road specifications today usually call for roadways that are much wider and pavement that is much heavier than would be required for a roadway to serve largely as a means of ingress to and egress from abutting property.

"While the practice varies in different jurisdictions, there is a growing tendency elsewhere in the country to follow the policy of paying more and more of the cost of roadway construction out of funds derived from highway users as a whole rather than out of assessments against abutting property."

Frost Heaving in Road Subgrades

Since the expansion of the soil caused by frost heaving is considerably greater than can be accounted for by the freezing alone, it must be due to air freed by the drop in temperature. Experiment has shown that in the absence of such air frost heaving does not occur. In soils containing colloids, frost causes alternate contraction and expansion of the colloids as the temperature falls and rises before and after the formation of ice. The place of the water absorbed in swelling is taken by air released from the soil moisture. If the air is not sufficient to fill all the space, shrinkage of the soil occurs with every fresh formation of ice, but if the air is more than sufficient, expansion results. Thus the degree of frost heaving depends primarily on the air content of the soil or soil moisture, and only secondarily on the moisture capacity of the soil or on the ground-

water. *Methods of preventing frost damage.* (a) Deep drainage extending below the frost penetration will not check frost heaving, though it will control the thickness of ice segregated. (b) The soil liable to frost damage may be removed, replaced on a waterproof layer, and covered with another. Calcium chloride or any strongly hygroscopic salt should be applied to the replaced soil, a thin layer of gravel or chippings laid and rolled, and provision made for surface drainage. This allows the soil to dry hard and acquire a constant bearing power. The following points should be noted: (1) There must be no possibility of rain-water penetrating mechanically between the impervious layer and the body of the road. (2) The soil must be as highly compacted as possible. (3) The surfacing should be pervious only to capillary moisture. (4) The drainage outlet should be surrounded with concrete or cemented stone setts to an area of about 10 sq. ft., to prevent the constant presence of damp air around it. Frost heaving may occur in the first winter after construction, but will not be excessive, and will eventually cease when the soil is completely dried. (c) Material not liable to frost heaving may be deposited. To be effective it must be deeper than the frost penetration. — *"Road Abstracts," from Bauingeneur.*

Vermont Supreme Court Decision Upholds Billboard Law

A release of February 26, 1943, by the National Roadside Council declares the unanimous decision made on January 5, 1943, by the Vermont Supreme Court upholding the constitutionality of the billboard law of the Green Mountain State will make history in billboard control.

The court not only declares the Vermont law constitutional but demonstrates that every State which follows its opinion can restrict, or even prohibit, highway billboards without infringing on any constitutional rights of the billboard industry.

"There is no *inherent* right to use the highways for commercial purposes," the court declares, and points out that the billboard is essentially a use not of private property but of the public thoroughfare. It is similar to the use of the highway by bus and trolley lines, for which uses permission may be granted or withheld by the State.

The court also declares that the private property owner has no inherent right to lease his highway property for commercial advertising unless such advertising applies solely to business on the property.

That the property owner has certain inherent rights in the adjoining street or highway, such as ingress, egress, light and air, has long been recognized by the courts. These rights are known as easements and are governed by the law of easements. The right to be seen from the highway (the factor which gives the billboard its value) is likewise an easement appurtenant to the land abutting upon the highway. But, according to established law, all such easements exist solely for the benefit of the property itself.

The right-to-be-seen or visibility easement entitles the property owner to maintain highway advertising only if it pertains to the property itself, its sale, its rental, or business conducted thereon. It does not include commercial advertising foreign to such business.

Under this court ruling, the property owner may lease space to billboards so long as there is no law forbidding it. But if the State enacts a law restricting or even forbidding highway advertising, neither the

JAEGER "Sure Prime"
— Pumps that Exceed Their Promises

The only pumps that, for years, have been individually tested and certified for vacuum, capacity, pressure and regularly exceed their guaranteed performance — with up to 5 times faster 100% automatic priming, high capacity under adverse conditions, thousands of hours of *extra* service. Self-cleaning shells, replaceable liners, longest life seal, oversize shafts — for high pressures, continuous heavy service.

Sales — Rentals — Service in Over 100 Cities
THE JAEGER MACHINE CO., 400 Dublin Ave., Columbus, Ohio
CONTRACTORS' PUMPS, MIXERS, HOISTS, PAVING EQUIPMENT

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SNO-PLOWS
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TO KEEP THE PLANES FLYING
KEEP THE SNOW FLYING

Whether municipal or military, airfield runways *must* be kept cleared of snow this winter.

. . . And the know-how that made FRINK the leader in keeping highways and streets snow-free is now turned to airport problems too.

Whatever your snow removal difficulty, FRINK has a solution. Just address:

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FRINK SNO-PLOWS OF CAN. Ltd., TORONTO, ONT.

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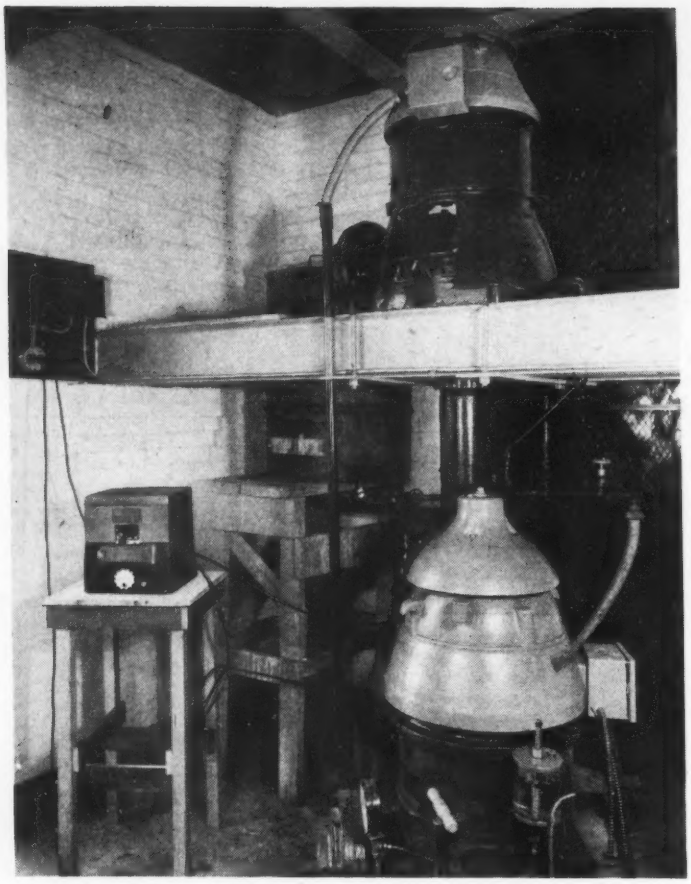

THIS VAR-I-FEEDER INSTALLATION IMPROVES THE WATER SUPPLY OF A FAMOUS AMERICAN BREWERY

The constant rate, electric driven Var-I-Feeder shown above, is cross connected on the starting switch of a one-million gallon per day water pump. Potassium permanganate (a most hard-to-handle chemical) and Calgon solution is drawn from the reagent tank shown behind the pump. The elevated tank is for mixing the two chemicals into one solution and for settling out before use.

Var-I-Feeder injects 2 gallons of this solution hourly into the 70 ft. level of well casing below ground.

The permanganate feed prevents crenothrix formation, an iron forming bacteria that must be killed before water is fit for brewery use. Calgon controls corrosion.

The Var-I-Feeder suction and discharge tubings are of flexible plastic.

Note the small size of this chemical feeder in proportion to the plant it serves.

Another feature of the new Var-I-Feeder is the controlling of feed by adjusting speed. This is done by simply turning the handwheel on the front of the machine until the needle on the illuminated scale points to the desired rate of feed. The Var-I-Feeder is made in both stationary and portable models—with the portable model having a total weight of only 57 lbs.

The Var-I-Feeder is manufactured by Chem-Feeds, Inc. Reservoir Ave. & Alvin St., Providence, R. I.

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property owner nor the billboard owner can legally claim that he is deprived of any constitutional rights. —*Highway Research Abstracts.*

Coliform Organisms in Frogs and Tadpoles

In Westminster, Maryland, in the early summer of 1942, contamination appeared in the water from taps throughout the town, although the treatment plant was producing a water of excellent quality, and the matter was investigated by the State Dept. of Health. An open reservoir floats on the distribution system, and in this was found an abnormal growth of algae, as well as large numbers of frogs and tadpoles. Samples of water from the reservoir showed the presence of coliform organisms. A special laboratory investigation indicated that *Escherichia coli* inhabited the intestinal tracts of several specimens of frogs and tadpoles taken from the reservoir. Since no known cross-connection existed between the public supply and any other supply, it appeared likely that the reservoir was the point at which contamination was introduced into the water. The reservoir was heavily chlorinated to kill the frogs and tadpoles and then drained, cleaned and refilled. To prevent future algae growth, a strict program of frequent copper sulfate treatment of the reservoir water was followed. When these recommendations had been carried out, contamination no longer appeared in the water from any of the sampling stations.

On the recommendation of the Health Dept., chlorine-ammonia treatment of the water leaving the water filtration plant was provided as a more effective safeguard to the quality of the supply.

Responsibility for Leaking Water Main

In an action against a municipality operating water works to recover damages resulting from water which allegedly accumulated in the cellar of plaintiff's house, the complaint charged that defendant township negligently permitted a leak in one of the water mains to continue through three summer months, so that water accumulated in the cellar of her house and caused damage thereto. Plaintiff contended that a notice of defect was given and that thereafter defendant failed to exercise reasonable care in finding the defect and correcting it. The New York Appellate Division (261 App. Div. 161, 24 N. Y. S. 2d 883) reversed a judgment for plaintiff on the law and facts and dismissed the complaint. Plaintiff appealed to the Court of Appeals, which dismissed the appeal unless a new undertaking should be filed. (Biancanello v. Town of Colonie, 35 N. E. 2d 510.)

The Appellate Division's decision was to the effect that even if notice of defect had been given early in August (as claimed by plaintiff) instead of late in September, as seemed more likely, defendant responded at once and its men employed the usual tests to discover a leak. They were not required to do more in the exercise of reasonable care. In the absence of surface indications, a reasonable mind might naturally suppose another cause, especially in view of torrential rains occurring in September. Defendant was not required to excavate to a point where the leak was finally discovered when ordinary tests failed to show any evidence of a leak.

Road Markings for Blackout Conditions

Tests show that embedding glass beads in the paint used for road markings more than doubles the visibility under blackout conditions. It has been found valuable for marking and numbering at airports.

TESTS conducted by the Division of Highway Transport of the Public Roads Administration showed that, under blackout conditions, a painted white center line on a concrete surface was of practically no value and a black line on concrete was observed about 30% of the time. On bituminous surfaces a white line was about 40% effective. When glass beads, about 1/100 inch in diameter, were embedded in the paint, the line was 83% effective on concrete and 90% on bituminous surfaces. When yellow paint was used the percentages dropped to 63 on concrete and 75 on black top. A 3″ or 4″ line reflectorized with glass beads was practially as effective as a wider one.

During daylight hours, the beaded stripes look like any other painted markings. After dark, however, the reflected light from the headlights of an automobile makes the stripe so prominent that it may even appear to the driver as a raised curb. Cross-walks, letters and figures on the pavement, and other auxiliary markings are equally retro-directive.

Cross-walk and special limit lines of one kind or another are naturally harder to see than longitudinal lines upon which the driver's eye can be steadily focused. Tests conducted on these markings by the same agency under blackout conditions indicate an increase of visibility from 34 per cent for plain white 8-in. markings to 95 per cent for beaded.

In tests conducted by the California Division of Highways using a standard Weston photographer's light meter, the reflection from automobile lights on unstriped blacktop pavement, registered 6 units. Under similar conditions, the reflection from standard white paint registered 18 units and on white paint with glass beads, the reading was 42 units.

It has been found difficult to apply the beaded paint to vertical surfaces. Signs may be laid flat while the application is made, but curbs, trees, etc., must be coated while in their vertical position. In these cases, it has been found that a glass-beaded cloth is much easier to apply and gives much more satisfactory results. It is generally glued in alternating strips on curbs and placed on higher objects to a maximum height of only 2½ ft. on the side facing the approaching traffic. The material is waterproof and will remain in place for a considerable length of time.

PLANNING FOR THE FUTURE?
Let's not forget the present—still let's plan for the future, too! Our vital transportation system calls for the construction of new Highways, Roads, Streets, and the repair of our present system, so be prepared—plan to purchase your Littleford Black Top Construction and Maintenance Equipment after Victory. Pave the Road to Victory first, pave the Roads later.
Upper Right: Littleford No. 101 Utility Spray Tank.
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Another development of the glass-beaded paint, which is becoming increasingly important at the present time, is its use as markings for airport runways and aprons, both as outline markings and in numbering of the landing strips.

As an auxiliary to the boundary lights, the application of the glass beads to the painted runway stripes is being used by many airports and has been found extremely valuable in both military and civilian operations. Although entirely invisible at any great height, the lines become clearly visible and give a sharp outline of the runway by reflecting the planes' landing lights at heights below 500 ft. They are thus invisible to possible enemy bombers, while definite and clear to the plane desiring to land.

A machine has been developed in the shops of the California department for painting the stripes and dispensing the glass spheres into the wet paint in one operation. The machine is pushed in front of a truck. Paint tanks carried in the truck furnish paint through hose connections to spray guns almost directly beneath the driver. A tank is mounted on the vehicle from which a steady flow of the beads drop into the wet paint. The bead orifice is about 18 in. to the rear of the paint spray guns. If required, three stripes may be painted simultaneously, as in the case of grades and sharp curves, where white, black and orange lines are used in parallel.

Also attached to the machine is a skip-striping attachment made from a bicycle wheel driven off the main wheel shaft by friction. The make-and-break is accomplished by points on opposite sides of a drum mounted just ahead of the bicycle wheel, and which operates the flow mechanism.

The nature of the paint used is very important. The originators of the use of beads in traffic paint have devoted much study to the perfection of a paint which will hold the spheres firmly and at the same time serve as a good reflective background. The State Highway Department of California has developed a bead-retention paint that has proved satisfactory. They have experienced some difficulty, however, during recent months due to wartime shortages of certain ingredients, but this is only a temporary difficulty.

Activated Sludge Study at Ann Arbor, Mich.

A unique method of design and control of the activated sludge process of sewage treatment is being put to a test in an exhaustive demonstration which opened at the School of Public Health, University of Michigan, Ann Arbor, Mich., August 5. Attending are 32 sanitary engineers, public health engineers, bacteriologists, chemists and sewage treatment plant operators.

A thorough discussion of the method was had in sessions held during the first two days of the demonstration. At these opening sessions a schedule of test operations was discussed and adopted by the group, and the schedule is now being carried on at the Ann Arbor treatment plant through the courtesy of the Board of Public Works of that city. Tests will be conducted over a period of several weeks and at the conclusion of the demonstration, a final report of the group's findings will be prepared.

Interest in the demonstration is shown in the attendance report. Organizations represented include: The Great Lakes Board of Public Health Engineers, the Upper Mississippi Board of Public Health Engineers,

As more materials are diverted to essential war uses, new equipment becomes more difficult to get. Greater care must be given present equipment until after Victory. Let your Gorman-Rupp distributor restore your equipment to its original operating efficiency. They carry parts and repairs for all equipment they sell. Their charges will be reasonable.

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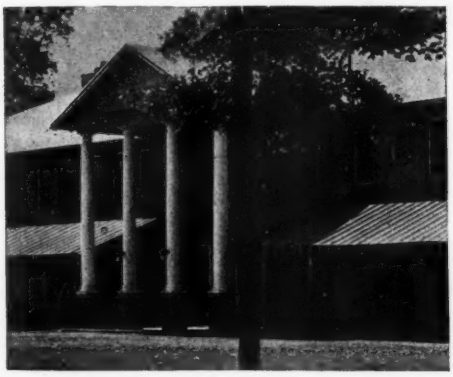

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TODAY, more than ever before, our friends and guests are depending on regular week-ends at this famous Spa to keep themselves fit for war-time duties.

After a period of exhausting, nerve-wracking incidents in your business, you need a few days at the Park spent in rest, relaxation and Spa baths in famous Magnetic Spring Water.

Our record speaks for itself—over sixty years of enviable service with 5,000 patrons—some families coming in the third generation—Magnetic Spring Water, the only medicinal water of its kind in the world—and served to Park Hotel guests only.

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the Michigan Section of the A.S.C.E. and the Michigan Sewage Works Association. The state health departments of Michigan, Wisconsin, New York and Illinois are represented, as are five cities in those states. Michigan State College, the University of Michigan and the U. S. Public Health Service also sent representatives. Several consulting engineers also participated in the program.

At an organization meeting held on August 5, W. F. Shephard, assistant engineer of the Michigan Department of Health, was named permanent chairman of the group. A. B. Cameron of Jackson, Mich., is chairman of the committee representing the Michigan Sewage Works Association; Clarence Hubbell of Detroit is chairman of the A.S.C.E. Committee; and E. F. Eldridge of Michigan State College is chairman of the Committee on Laboratory Tests and Analytical Procedures.

Community Forests for Revenue and Recreation

Community forests, unknown in the United States 30 years ago, have grown in number to approximately 1,500 since Newington, New Hampshire borrowed the idea from Europe in 1910. At least three million acres of forest land are now owned and administered by municipalities or their subdivisions, such as schools and hospitals, chiefly in the North Atlantic States. The forests provide growths of trees for watersheds, recreation areas, and frequently bring in revenue from the sale of mature timber or provide cordwood for needy families. Forests maintained by water departments on their watersheds constitute but a small percentage of the total area of community forests.

Principal proponent of the community forest movement is the Forest Service. Numerous booklets describing the profitable European town forests and some of the developments in America, and telling how to undertake such enterprises, are published by the Service and are available to municipal officials.

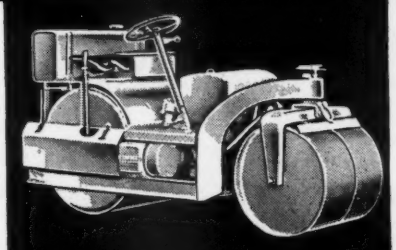
Recent press releases of the Service point out successes with forests of 810 acres at Newnan, Ga.; 300 acres at Barnesville, Ga., and 800 acres at Manchester, Ga.; and call attention to the Lake City, Fla., forest of 63 acres, the Luling, Texas, undertaking of 50 acres, the Canton, N. C., forest of 500 acres and the public school forest of 50 acres at Greensboro, N. C.

States where they are most frequent include: New York, 579; Massachusetts, 177; Wisconsin, 174; California, 158; Pennsylvania, 134; Michigan, 112; and New Hampshire, 102. The Forest Service's incomplete analysis of the distribution of town forests report three in Alabama, one in Florida, 25 in Georgia, two in Kentucky, three in Louisiana, 37 in North Carolina, three in South Carolina, and three in Virginia.

The growth of timber crops is usually the ultimate objective, though many are stocked with game for hunting. Net revenue from sales of timber in some cases has amounted to thousands of dollars.

The forests usually require only small initial investments. Sometimes tax-delinquent lands are deeded the city by owners who can put them to no profitable use. One Massachusetts town converted an abandoned poor farm into a community forest. The state forester often supplies seedling trees free or at low cost. According to the American Municipal Association, local boards or forest committees usually control the community forests, and in about 40 cases professional foresters are employed.

C. H. & E. CONSTRUCTION EQUIPMENT



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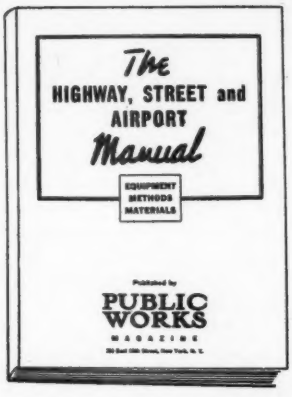

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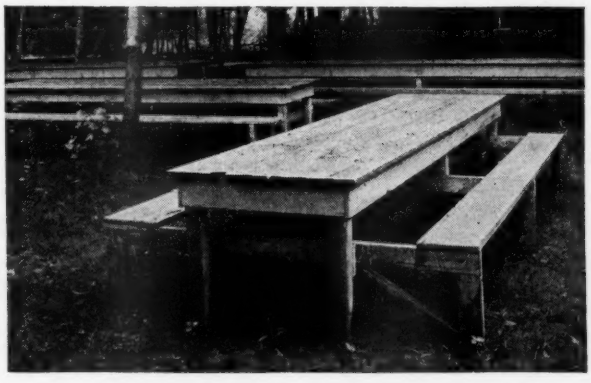
Rot is Unappetizing



CUPRINOL **Stops Rot and Insect Borers**

In public parks, picnic and recreation grounds you are judged by the condition of your wood construction. Rot and decay breed dissatisfaction—and repairs are costly. But you can prevent wood rot and stop insect borers with Cuprinol, applied by brush, spray or dipping to any unpainted wood. It can be used by itself or as a priming coat, and has a 30 years successful record for preserving wood, fabrics and rope. You can't afford rot, but you can afford Cuprinol.

Send for descriptive literature

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General view of Findlay, Ohio, plant. Main building at right; sludge beds and digester at left.

The Sewerage Digest

Abstracts of the main features of all important articles dealing with sewerage and sewage treatment that appeared in the previous month's periodicals.

Digestion of Pure Vegetables

Studies were made at Cornell University to learn the effect of the addition of pure vegetable solids to heated, well seeded separate sludge digestion tanks, cabbage, carrots and potatoes being used. One tank was used for each vegetable and two control tanks without vegetables. The investigation lasted 315 days. The three vegetables digested satisfactorily. There was a more complete breakdown of the volatile solids in the carrot and potato tanks than of those in the control tanks, and about the same in the cabbage tank as in the controls. Potato skins did not digest as readily as potato pulp. The pH in the vegetable tanks was as high as or higher than in the controls. Gas from the vegetables contained a higher percentage of CO_2 and lower percentage of methane than did that from sewage solids; and totaled less per pound of volatile solids consumed. Digestion of cabbage gave off strong odors, which were satisfactorily controlled by adding activated carbon or ortho-dichlorbenzene.[C49]

Digestion of Undiluted Excreta

Human excreta used as fertilizer in far eastern countries are a major vehicle in spread of intestinal diseases. Ascaris in stored excreta do not live longer than 2 or 3 months, hookworm ova 2 or 3 weeks, typhoid and dysentary bacilli 2 to 14 days. Since digestion of excreta requires at least 60 to 80 days, this would apparently remove the danger. Seeded faeces alone digest readily, but undiluted mixtures of urine and faeces refuse to digest in a normal way, even though seeded and held for a year, due to the ammonium carbonate resulting from the rapid decomposition of the urine. This can be remedied by digesting with it some CO_2-producing substance such as cellulose or garbage, producing ammonium bicarbonate. This is effected by adding 76.8 lb. of dry volatile solids of rice straw or 29.4 of garbage per 1,000 people per day, and providing digestion tank capacity of 3 cu. ft. per capita. The tank suggested would have a horizontal screen of ¼ in. mesh about 1/3 the way up; the faeces would be separated from the urine by a fine screen and introduced in the bottom of the tank, together with straw or garbage, and the urine introduced in the top. CO_2 formed at the bottom bubbles up through, and is absorbed by, the urine. This is followed by further digestion in a secondary tank.[C51]

Determining Grease in Sewage

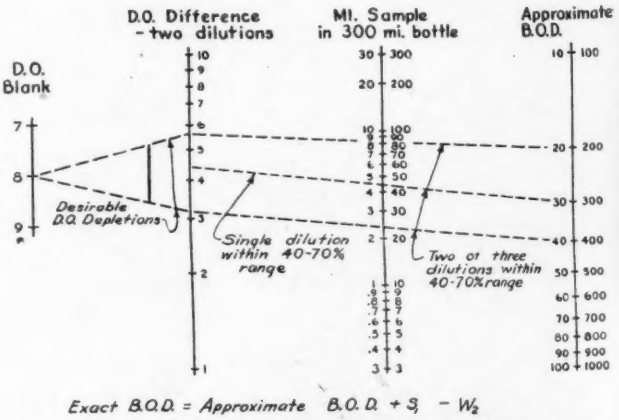
In eight New Jersey cities the amount of grease in sewage solids has been found to vary from 29% to 42%, averaging 36%, 31% of the settleable solids being grease. But in spite of the importance of grease in sewage treatment, few plants make grease determinations because of the time, intricate technique and special apparatus required by the standard method. The author, noting that practically all fats and soap can be extracted from dry sewage matter by treatment with mineral oil at a temperature around 130°, and that residual mineral oil is readily removed by a rapid wash with a solvent, has developed a simple method giving results on dried sludges at the rate of six in less than an hour, on wet sludge in about two hours, and on sewage in three hours. Satisfactory checks were obtained between this and the acidification-petrolic ether extraction method.[G18]

Simplified B.O.D. Determination

By algebraic manipulation of the "Standard Methods" equation for B.O.D. determination, the author developed the equation $\text{B.O.D.} = \frac{\text{W-D}}{\text{P}} + \text{S-W}$ in which W= D.O. in incubated diluting water; D= D.O. in incubated dilution (sample); P= decimal proportion of sample in the dilution, and S= D.O. in undiluted sample. This has the advantages that: 1—The number of required dilutions and D.O. determinations is a minimum. 2—Even for exact results, the calculations are of the simplest form. 3—Under ordinary circumstances the original D.O. of the sample may be estimated. 4—If equal quantities of seed are added to each bottle, the B.O.D. of the seed does not influence the calculations. 5—Any immediate oxygen demand of the sample is completely measured. 6—The B.O.D. of the diluting water does not influence the results. 7—Any difference between the quality of the D.O. test reagents before and after the incubation period is not exaggerated by the dilution factor. 8—It is satisfactory for application to all types, strengths and conditions of waste or polluted waters, and takes into account the original D.O. of the undiluted sample in a straightforward manner. An alignment chart calculator (see cut) has been found convenient for solving the equation.[G19]

Experiments in Modified Sewage Aeration

These experiments were made in a pilot plant at New York City's Ward Island Plant, using two aeration tanks, each divided into four channels or passes through which


D.O. Difference - two dilutions
Ml. Sample in 300 ml. bottle
Approximate B.O.D.
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Desirable D.O. Depletions
Single dilution within 40-70% range
Two or three dilutions within 40-70% range
Exact B.O.D. = Approximate B.O.D. + S - W₂

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Alignment chart for B.O.D. calculations.

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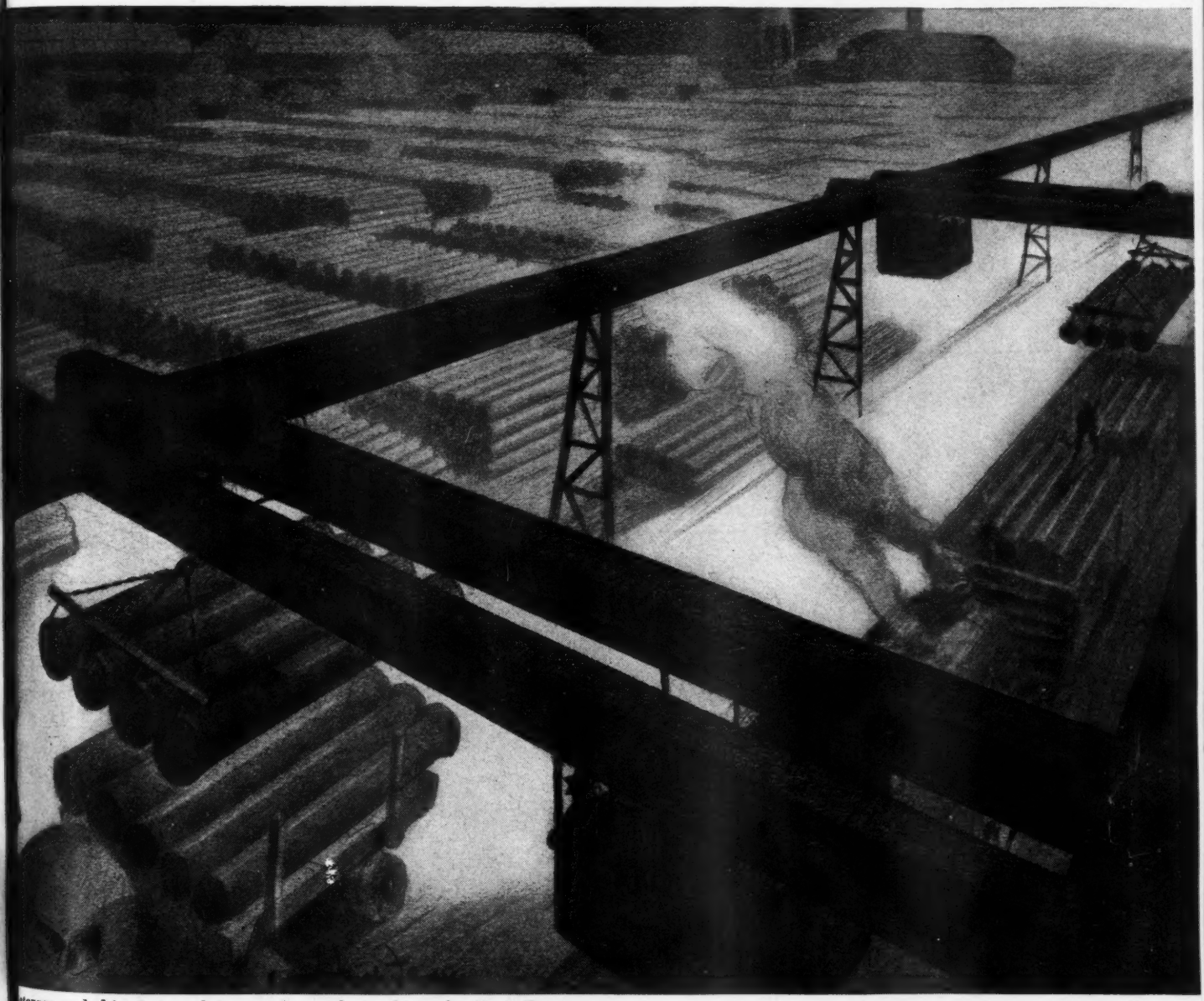

Storage and shipping yard at one of our plants, drawn by Hugh Ferriss.

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the sewage flowed in succession, the end of each pass being connected to the head of the succeeding pass through a small port. The types of aeration considered were: Without the return of activated sludge or liquor; with continuous return of aeration tank liquor from the fourth pass; and with the return of activated final settling tank sludge.

Conclusions from these experiments were that: By 1.5 hr. aeration in these three ways it is possible to obtain reduction of suspended solids and B.O.D. of 30-40%, 60-65%, and 65-75% respectively. By 3 hr. aeration these percentages would be increased to 60-65%, 65-70% and 75-85%. The quantity of aerator effluent returned varied from 20 to 100% of the sewage flow, and that of sludge from 6 to 25% at a concentration not exceeding 5,000 ppm.

The sludge produced from aeration periods of less than 3 hr. could be wasted at a concentration of 4.0 to 5.0% solids when fresh; on storage, it undergoes rapid deterioration at summmer temperatures, having a tendency to bulk and produce vile odors.

The shorter the aeration period the greater the fluctuation of effluent quality during a 24 hr. cycle. For 1.5 hr. aeration the lowest and highest B.O.D. in a 24 hr. period varied from 60 to 160% of the average hourly B.O.D.

The bulk of the microorganisms presumably responsible for flocculation by these methods are large bacteria, cocci, spirochaetes, zooglea, filamentous bacteria, and a few of a large variety of free swimming and stalked ciliates, rotifers and acquatic earthworms.[C47]

War Industrial Wastes in Illinois

Among the industrial waste problems in Illinois due to wartime industry is that of alcohol wastes, practically all of which are produced in one area on the same stream. Many of these plants have applied to WPB for waste recovery equipment, realizing that recovered waste is a valuable by-product, providing a valuable cattle food; while excluding it from the stream, which furnishes fish in commercial quantities, will permit the fish industry to continue in operation.

Another problem is presented by the great increase in cheese manufacture, whey from which is upsetting sewage treatment plants in many small municipalities. Also over 5 mgd of brine from oil fields must be disposed of other than by discharge into streams. Over 150 installations are returning over 3 mgd to the underground salt water.

Enormous wastes from TNT manufacture are normally acid and of a distinct red color, toxic to the organisms in digestion tanks. Filtration through sand or rock is not effective and both this and evaporation are hazardous. Chemists are working on the problem. Apparently a solution is combining it with alkaline wastes and lime sludge from softening plants, producing a mixture that is slightly alkaline and not objectionable in color.[H85]

Sedimentation Tank Inlets and Outlets

Of the three types of tank, longitudinal flow, radial flow and vertical flow, the first is by far the most common and is the only one considered in this discussion. The T or elbow inlets and outlets are fairly efficient for tanks 6 to 8 times as long as wide and with depth at least twice the width. An improvement that gives fairly good results for relatively long tanks and moderate flow is placing a "target baffle" in front of straight narrow inlets. An inlet designed for Imhoff tanks by G. E. Hubbell gave 50% increased efficiency with 3½ times the rate of flow, reducing approach velocity to practically zero and distributing the flow across the surface of the tank and directing it downward.

Outlet weirs along the sides of the tank and across it at intervals for the last half have been effective in

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several tanks, giving successively slower velocities of flow as the outlet end is approached. Among other ideas are sloping end walls, and a stilling chamber with about 20 around-the-end baffles between the tank and a pump that discharges intermittently. Inlet devices that drop the flow into the settling compartment should be avoided.[C45]

Strategic Materials In Treatment Plants

Use of strategic material in constructing treatment plants can be minimized by reverting to old-time devices —hand-cleaned wood bar screens; earthen tanks, unlined or with sloping sides lined with plank or concrete, for sedimentation tanks, trickling filters, etc.; providing uniform pollution rate of effluent throughout the 24 hrs. by use of fill-and-draw basins; intermittent sand filters.

Discussing this, S. A. Kowalchik (N. J. State Dept. of Health) expressed his firm conviction that control of stream pollution is an essential activity, for which critical materials should be and are obtainable; and that every detail of a plant should be built with a view to permanence, and provision made for installing omitted items at a later date.[C46]

Sinking Funds For Postwar Work

The Oregon State Sanitary Authority has advised all municipalities whose sewage disposal facilities are inadequate to prepare engineering plans and specifications; also develop proper fiscal programs for carrying them out by creating sinking funds, either by means of a sewer user service charge, or by levying a general annual tax. Or many of them may adopt special assessments, or general obligation, limited obligation or self-liquidating bonds. Two Oregon cities are now creating sinking funds with sewer service charges, five by general tax levies or money from the general fund, two have authorized bond issues and seven have asked for F.W.A. assistance.[H36]

Flow Recorder For Parshall Flumes

Wellsville, N. Y., sewage varies from 0.8 to 1.0 mgd dry weather flow to 6.0 mgd storm flow. (Leaky sewers.) The flow indicating and recording gauge on the 12" Parshall flume reads only to 4.2 mgd. To permit reading higher rates, Supt. Slough made a recording unit consisting of a flanged pulley turned by a counterweighted cable from a float in a stilling well, fixed on a shaft that also carries a pinion gear which meshes with a spur gear on a second shaft with 1:3 ratio. The second shaft carries a pen arm made from a hack saw blade. An electric clock is cut on by a mercroid switch just prior to the upper limits of the regular recorder, the new recorder then taking over; and the exchange is reversed when the flow falls below said limit. The recorder was calibrated by marking on the chart circles obtained by measuring known flows, and calculating others.[G17]

Brick Arches for Sewage Tank Walls

Brick has been used instead of reinforced concrete for the walls of 16 circular clarifier and digester tanks of 50 to 70 ft. diameter and 8 to 18 ft. height in eastern army camps. The wall is built of 24 brick arches between 24 buttresses made of concrete-filled concrete blocks. In some deep tanks, supplemental arches convex outward are built between buttress to resit the earth pressure, the lenticular space between the arches being left empty.[E17]

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Effect of Activated Sludge on Poliomyelitis

Investigation of the effect of activated sludge treatment on the removal or inactivation of poliomyelitis virus showed that activated sludge in amounts as low 1,100 ppm, with 6 hr. aeration, removed or inactivated the virus to an extent sufficient to render it non-effective to mice when injected introcerebrally.[C50]

Bibliography of Sewerage Literature

The articles in each magazine are numbered continuously throughout the year, beginning with our January issue.

c, Indicates construction article; *n*, note or short article; *p*, paper before a society (complete or abstract); *t*, technical article.

C *Sewage Works Journal*
July

45. Inlet and Outlet Design for Sedimentation Tanks. By J. Henry L. Giles. Pp. 609-614.
46. Solving Wartime Pollution Problems With Minimum Use of Strategic Materials. By Christian L. Siebert and F. B. Milligan. Pp. 615-628.
47. Modified Sewage Aeration. By L. R. Setter. Pp. 629-641.
48. *t*. Concentration of Activated Sludge by Compacting and Flotation. By Willem Rudolfs. Pp. 642-657.
49. Digestion Studies on Pure Vegetables. By Conrad P. Straub. Pp. 658-672.
50. Effect of Activated Sludge Process on Poliomyelitis Virus. By Gerald M. Ridenour, Harve J. Carlson and Charles F. McKhann. Pp. 673-678.
51. Anaerobic Digestion of Undiluted Human Excreta. By J. R. Snell. Pp. 679-701.
52. Sewage Sludge for Victory Gardens. By W. H. Wisely. Pp. 710-711.
53. Protection of Sewage Works in War Time. By Wm. T. Ingram. Pp. 711-724.
54. Management of Sludge Digesters. By E. J. M. Berg. Pp. 724-729.
55. Trickling Filter Operation at Corpus Christi. By S. L. Allison. Pp. 729-733.
56. Improving Efficiency of Sedimentation of Sewage. By J. M. Jones. Pp. 733-736.

D *The Surveyor*
July 23

20. Flow in Silted Sewers. By E. Dixon Grubb. Pp. 307-308.

E *Engineering News-Record*
July 29

16. A Weir With Flow Proportional to Head. By Edward Gerald Smith. Pp. 72-73.
August 12
17. Brick Arches for Tank Walls. By Odd Albert. Pp. 88-90.

G *Water Works and Sewerage*
August

17. A Simplified Flow Recorder for Parshall Flumes. By John D. Slough. Pp. 285-286.
18. A Rapid Method for Determining Grease in Sewage and Sludges. By Harry W. Gehm. Pp. 305-308.
19. The Mathematics of B.O.D. Determinations. By H. M. Gifft. Pp. 313-315.

H *Sewage Works Engineering*
August

34. Pickle Liquors Fail to Upset Activated Sludge Operation. Pp. 364-366.
35. Illinois War Industries Utilize and Treat Wastes. By Clarence W. Klassen. Pp. 372-374.
36. Oregon Urges Cities to Finance Postwar Work. By Kenneth H. Spies. Pp. 374-375.

J *American City*
August

11. Pryor, Okla. Meets a Sewerage Emergency. Pp. 56-58.

P *Public Works*
August

30. Treatment of Supernatant Digester Liquor. By Willem Rudolfs and L. L. Faulk. Pp. 13-15.
31. Screening, the Solution of a Troublesome Trade Wastes Problem. By Arthur L. Boley. Pp. 20-21-26.
32. Joint Sewerage Facilities for 13 Local Units. P. 34.
33. *n*. Copperplating by Sewage. P. 34.
34. *c*. Hazards in Trench Excavation. Pp. 38-39.
35. Non-Metallic Garbage Cans. P. 41.

Change in Sewer Rates Not Retroactive

Where a rate charged by a sewerage company under the Pennsylvania Public Commission's order was accepted by the commission as complying with the order, it was held to be a commission-made rate and the commission could not, on complaint of a patron, award reparation for its collection for a period prior to notice to the company that the commission had determined the rate to be unreasonable. When the commisison gave such notice by instituting on its own motion a proceeding to determine the reasonableness, it could properly find reparation payable for the period following the filing of the complaint to the effective date of the new tariff. (Cheltenham & Abington Sewerage Co. v. Pennsylvania Public Utility Commission, Pennsylvania Superior Court, 22 A. 2d 37.)

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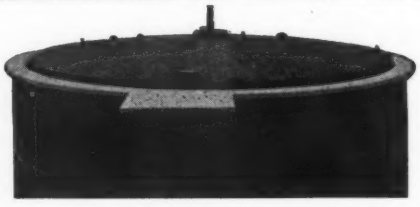

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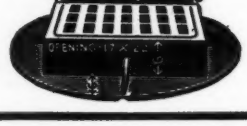

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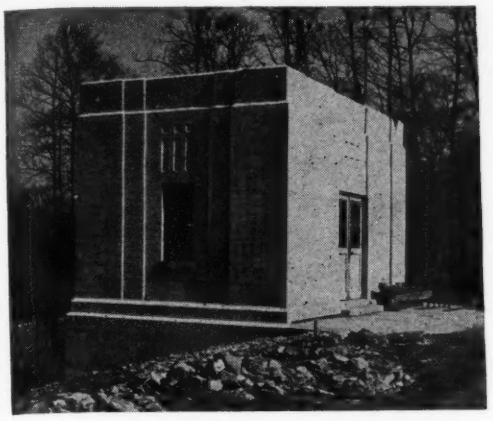


Gate house at sedimentation tank of Ashland, Ky., waterworks.

The Waterworks Digest

Abstracts of the main features of all important articles dealing with waterworks and water purification that appeared in the previous month's periodicals.

Air-Inlet Valves For Steel Pipe Lines

If a thin-walled pipe should break, or a quick-opening valve be opened, at the foot of a grade, the sudden increases in velocity of flow will tend to cause a vacuum, especially at any point where the grade up the line flattens out, even though it may not be a summit. To prevent collapse of the pipe, an air-inlet valve should be placed at every such point. What the inlet capacity of the valve should be can be calculated by formulas given in this article.[E14 *]

Pulsating Discharge Through Vertical Wasteway

San Pablo dam, San Francisco, built 25 years ago, had an open chute spillway and a vertical shaft wasteway. The latter was made by carrying a concrete-lined shaft vertically up from a tunnel used for diverting the stream during construction of the dam, the tunnel being plugged at its upper end. Both shaft and tunnel were 14.5 ft. in diameter. There were three 5 ft. round openings in the shaft, two 106 ft. above tunnel center and one 129 ft. The shaft was not used until 1936, when the gates at these openings were opened enough to pass 350 sec.-ft., and this water, descending the shaft, entrapped and compressed the air in it, which escaped at the tunnel outlet in exploding bubbles, producing such violent reactions as to rupture the tunnel linings. A remedy for this, checked by a model with linear dimension ratio of 1:14.5, is now under construction. Another concrete plug was built at the junction of shaft and tunnel, through which water is admitted to the tunnel by means of gate-controlled passages that discharge under water, the level of which is maintained by a weir at the tunnel outlet.[E13 *]

Geologist's Report Worth Many Times Its Cost

Cambridge, Mass., needing to increase its water supply, received an offer from a well drilling concern to obtain 5 to 6 mgd from wells. A geologist's report, costing $450, stated that the underground stream from which these wells would draw would flow by gravity into Fresh Pond, from which the city drew part of its supply, if they lowered the level of the pond a few feet. This they did in 1941, and since then have obtained from the pond 5 mgd more than formerly, at no additional cost.[A97]

Leak Survey Brings Large Savings

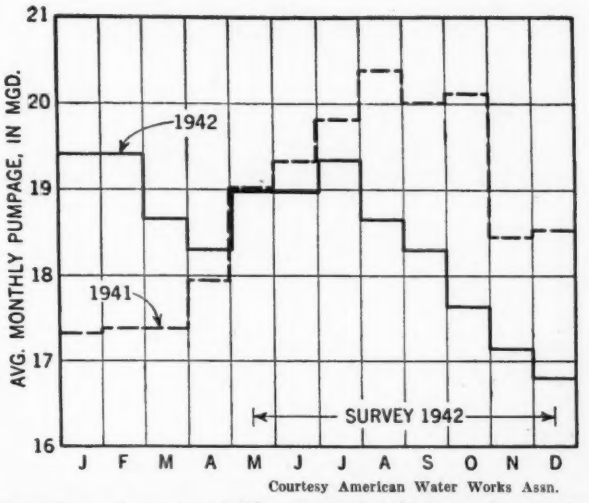
Allentown, Pa., population 100,000, in 1941 found its water consumption exceeding the plant capacity. The system includes 170 miles of 4" to 36" c. i. pipe, some of it and of the services being 100 yr. old. In 1942 the Pitometer Co. made a waste survey, including mains, large meters and pump slip. As a result of stopping leaks so discovered, the pumpage of water fell from 19.5 mgd to 16.5-17.5 mgd, in spite of 2 mgd added consumption, and the income from large meters was increased. The cost of the survey, including house-to-house inspections and repairing leaks, was $21,083. Replacing and repairing 200 defective valves cost $8,427. The saving in alum was $2,500 and in coal and electricity $10,000 a year. Total savings, $69,584 a year (including stopped leakage figured at 4 cts. per 1,000 gals.).

Only two leaks of the 190 discovered were found in the 85 miles of mains laid within the last 25 yr. The leaking valves, which had all been in use 40 to 75 yr., had leaking glands, broken or bent stems, etc. In all, 121 service leaks were found. The average house waste averaged only 6 gpd per service.[A99]

Reducing Operating Expenses

Marshalltown, Ia., 20,000 population, has lost 10% of its population, and therefore of its water income, since 1941. Reducing expenses being necessary, it has not laid a foot of water main since Pearl Harbor or added a single item to its stock; has salvaged unnecessary valves for use elsewhere; reduced the number of employees; left the lawns unmowed; welded everything that can be welded; hammered back into shape meter cases distorted by freezing.[A100]

Elgin, Ill., found its two meter readers drove 720 mi. a month to pick up missed readings. Now, instead of recalls, the reader leaves in the consumer's mail box a post card asking him to read the meter himself and send the result to the office. About 30% of the cards are returned, very few with incorrect readings. The cards cost about $7 a month; re-calling would mean recapping eight tires every



Courtesy American Water Works Assn.

Comparison of average daily pumpage in Allentown, by months.

*See Bibliography in the August issue.

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14 or 15 months. Meter bottoms used to be cleaned with an electrically operated wire brush at a cost of 9.4 cts. each. Now they are cleaned in a rattle barrel (like those used in foundries) made from an old washing machine, at a cost of about 1.5 cts. each. By "grinding in" measuring chambers and disc pistons, 509 potentially worn out meter chambers were renewed in 1942.[A101]

Postwar Waterworks Materials

Inquiry addressed to 70 companies supplying waterworks equipment and materials indicates that the old standard materials will be available after the war without major competition from new ones. Planning and designing postwar projects should be prosecuted at once, since there are no indications of postwar developments which will have more than minor effect upon present-day plans. One manufacturer felt sure that "a relatively large proportion of substitute materials will be displaced by the original product as soon as it is again available." Among probable postwar changes are: Use of high-speed diesel engines for driving peak load booster pumps and stand-by units; use of electronic devices for measuring temperature, turbidity, pH, color, etc., and in automatic control where speed of operation and control is essential, but no major developments are anticipated. Plastics may in time supplant hard rubber and bronze in meters and other equipment. Synthetic tubing will be available to compete with rubber, vitreous and glass tubing for conveying chemical solutions.[A104]

Orthotolidine Colors And Color Standards

"This paper presents a record of a visual spectrophotometric study of preparation of the orthotolidine-chlorine colors for residuals up to 10 ppm chlorine and of a practical set of permanent chlorine standards to match these colors." The recommended procedure requires: 1—That the ratio of orthotolidine to chlorine be at least 3:1 by weight. 2—That the ratio of acid to orthotolidine be at least 100 ml. of concentrated hydrochloric acid per gram of orthotolidine. 3—That the pH be between 0.3 and 1.3. 4—That it be prepared by the addition of the chlorine water to the orthotolidine reagent with continuous mixing.

This procedure will effect: 1—More rapid color formation, especially with chloramines. 2—Increased stability of color. 3—A color that obeys Beer's law up to 1.5 ppm and deviates from that law at a uniform rate for residuals from 1.5 to 10.0 ppm. 4—Less interference due to iron or to nitrites. It does not alter the interference due to manganese.[A106]

How K. C. Water Department Economizes

Kansas City, Mo., has effected economies since 1940 by reducing personnel from 630 in 1940 (900 in 1938) to 375 more efficient ones; and by making purchases through honest competitive bidding; by close control of peak loads; checking and repairing water meters; changes in water purification procedure; and by adopting a modern accounting and collection system.[G31]

Topeka's Concrete Concentric-Ring Tank

A description of design details and construction methods of the water tower briefly described in [J16] (August Waterworks Digest). In order to keep as light as possible the forms for the floor slab of the elevated tank, these were made only strong enough to support a reinforced concrete slab 6" thick; then, when this had set, the main slab 24" thick was constructed on it. To secure watertightness in the tank concrete, it was made of limestone aggregate, with a working stress of 0.35 f in the concrete and 8,000 psi in the steel; and the surface of the floor was treated with an asphalt base primer coat and three layers of 30 lb. roofing felt mopped with asphalt, covered with a layer of 1¼" premoulded asphalt plank set in plastic cement, and this in turn covered with a squeegee application of hot asphalt cement. In constructing the four concentric tower

walls, all were carried up at the same rate so that the working platforms for all were always on the same level.[E16]

Reconditioning Deep Wells

In 1942 New York City reconditioned about 300 wells in sand strata on Long Island, 64 by compressed air, 45 by means of surge blocks and the rest by surge pumping. The screens had been in place from 5 to more than 25 yrs. This experience led to conclusions that many wells whose yield has fallen off due to screen trouble can be redeveloped much more economically than they can be replaced; that redevelopment by compressed air is moderately effective and is the most economical method for wells about 150 ft. or more deep; that use of surge blocks gives maximum development, but requires the most time and the use of highly trained men to avoid damaging the well; and that surge pumping is the most economical for shallow wells, does not require special equipment or skilled men and there is no danger of damaging the well.[F53]

Filter Wash Water Saved

At Anna, Ill., to reduce cost of softening and pumping and utilize all the well yield, the softened water used for filter washing, 12,000 to 15,000 gal. per washing, is pumped back to the Accelator softening basin, passing through it with the raw well water. This saved two million gallons of wash water the first year, worth about one-sixth of the cost of the sump and pump used for recovering the wash water.[F54]

Experimental Plant at Miami

The Miami, Fla., well water supply has a color of 60 to 100, a faintly sulfuretted odor, and a temperature of 78°F. Treatment by aeration, lime and alum to remove carbonate hardness, chlorination, stabilization with CO_2, and filtration removes practically all of the dissolved iron and reduces the color to 18; but this color is undesirably high, and organic matter produces unpleasant tastes when chlorinated; also the hardness—88—is undesirably high.

To investigate suggested improvements, a pilot plant treating 10 gpm has been constructed and operated since early in 1942. It is similar to the present plant, the desire being to make as few structural changes in this as possible. Later a "Hydrotreator" and an "Accelator" were added, and an ozone generator and absorption tower. To date, experiments indicate that the residual color can be reduced to an acceptable value by adding less than 2 ppm of ozone. The rapid upflow types of softener give promising results, and would increase the plant capacity 50% if existing clarifiers can be remodeled to use the process. Also if the ozone process be employed the filtration rate could be increased 50%. It is proposed to maintain the pilot plant permanently to try out future suggested improvements.[A107]

Bibliography of Waterworks Literature

The articles in each magazine are numbered continuously throughout the year, beginning with our January issue.

c. Indicates construction article; *n*, note or short article; *p*, paper before a society (complete or abstract); *t*, technical article.

A *Journal, American Water Works Ass'n*
August

97. Economic Addition to Cambridge, Mass., Supply. By Timothy W. Good. Pp. 983-986.
98. Kansas City Improvements Meet Wartime Conditions. By Kenneth K. King. Pp. 987-992.
99. Water Saving Survey in Allentown, Pa. By William R. Schnabel. Pp. 993-998.
100. The Problem of a Diminishing Demand at Marshalltown, Ia. By H. V. Pedersen. Pp. 999-1001.
101. How the Meter Division Met Wartime Emergency Conditions in Elgin, Ill. By LaVerne Trentlage. Pp. 1002-1004.
102. Financial Problems of Civil Defense. By Henry Berry. Pp. 1005-1008.
103. Water Supply Practice in Army Training Centers. By Lewis H. Kessler, V. Bruce Sundstrom and Arthur O. Tomek. Pp. 1009-1050.
104. Postwar Waterworks Materials. By W. Victor Weir. Pp. 1051-1057.

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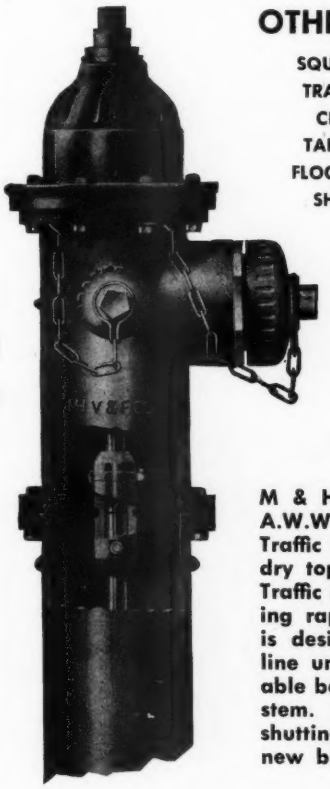

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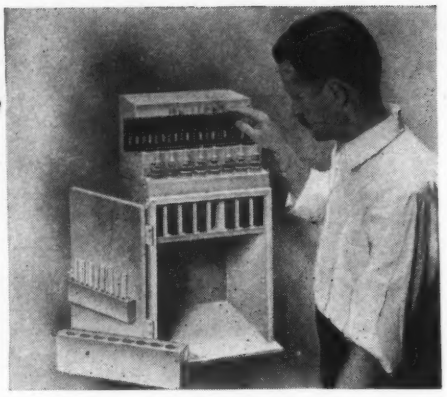

The Taylor Dalite pH Slide Comparator is ideal for all routine testing—in daylight, at night or in the dim recesses of plant or laboratory.

Comparator consists of a Model T-O base which sits on a shelf in front of dalite glass and special bulb, any 3 to 8 color standard slides, vials of indicator solutions with 0.5cc pipettes and 10 - 5cc test tubes. All equipment fits in the 12 x 12 x 21 inch wooden case.

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105. Studies Relating to Use of Saran for Water Pipes in Buildings and for Service Lines. By F. M. Dawson and A. A. Kalinske. Pp. 1058-1064.
106. Production of Orthotolidine-Chlorine Colors. By N. S. Chamberlin and J. R. Glass. Pp. 1065-1084.
107. Experimental Treatment Plant at Miami. By A. B. DeWolf. Pp. 1085-1089.
108. Recruiting and Training Auxiliaries for Water Works. By Earl Devendorf. Pp. 1090-1095.

D *The Surveyor*

July 2

13. *p.* Control of Chlorination. Discussion of D9. Pp. 277-278.

July 9

14. *p.* Control of Chlorination. Discussion of D9. Pp. 285-286.

E *Engineering News-Record*

July 29

16. Concentric-Ring Concrete Tank for Topeka. Pp. 68-71.

F *Water Works Engineering*

July 28

51. Supervising Water Quality in Massachusetts. By Nathan N. Wolpert. Pp. 828-830, 850.
52. Recording Meters at Springfield, Mass. By Charles G. Richardson. Pp. 831-833.

August 11

53. Redeveloping Well Yield. By August D. Henderson. Pp. 882-886.
54. Wash Water Saved and Returned to Accelator. By John S. Bacon. Pp. 888-896.

G *Water Works and Sewerage*

August

31. *p.* Kansas City Water Improvements Meet Wartime Conditions. By Kenneth K. King. Pp. 287-289.

J *American City*

August

17. New Dam Strengthens Maryland Water Supply. By Harry R. Hall. Pp. 51-53.
18. Fast Freight Water Distribution. P. 79.

L *Civil Engineering*

August

6. Earth-Filled Dam at Santa Fe, New Mexico. By Joel N. Van Sant. Pp. 366-369.

P *Public Works*

August

38. Fifty-three Years' Development of a Missouri Water Plant. By Charles W. Miller. Pp. 16-17.
39. Creosoted Wood Dam for Water Supply. P. 22.
40. *n.* Census Data on Water and Sewerage. P. 35.
41. Wartime Operation of New Bedford's Water Works. P. 36.
42. Depreciation Reserve in Water Rate Regulation. Pp. 40-41.

W *Johnson National Drillers Journal*

July-August

5. The Construction of Sanitary Wells. Pp. 1-7.

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Vertical, High-Speed, Hollow-Shaft Synchronous Motors

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Schenectady, N. Y.

A new line of vertical high-speed, hollow-shaft synchronous motors, has been announced by the Motor Division of the General Electric Company. Furnished in ratings from 100 to 1000 hp., and in speeds from 514 to 1800 rpm, these motors are especially desirable for pumping applications where a large volume of fluid is handled, such as on municipal and government water projects.

For protection, these motors have a dripproof enclosure. They are streamlined throughout to provide a pleasing appearance, and their smoothly contoured lines will not easily collect dirt and dust. The top cover of the motor is easily removed to permit adjustment of the pump shaft. In addition, easy access to the brushes and the collector rings is obtained by simply unlatching a flush-mounted steel plate.

The frames of these motors are of cast-iron construction to provide strength to withstand the high-thrust loads often encountered in pump applications.

The motors can be furnished with non-reverse ratchets to prevent reversal of pump rotation at shutdown or on starting. They are also available in solid-shaft construction.

"Scotchlite," A Reflecting Sign Material

Minnesota Mining and Mfg. Co.
St. Paul 6, Minn.

"Scotchlite" is a reflective sign sheeting composed of countless glass beads scientifically applied and bonded to a flexible synthetic resin backing. Each bead is made to perform as a minute optical lens, focusing the light rays to points on the highly reflective surface in the back of the material. These bright focal points then act as thousands of tiny sources of light which are projected out through the beads back to the light source.

It is claimed that signs made with "Scotchlite" not only reflect more light, but that light is spread out over the entire sign surface. Because of this feature "Scotchlite" is easily and rapidly read at great distances.

"Scotchlite" is available in three colors. White and yellow for standard highway traffic control signs; silver for use on signs and markers where maximum observation distance and target value are desirable and necessary, such as on bridge abutments, guard rails, barricades, stop signs, airport runway markers, etc.

A free booklet illustrating and describing in detail the uses and advantages of "Scotchlite" is available on request to the mfrs.

Pump Test Code Revised

Hydraulic Institute, the national trade association of pump manufacturers, announces complete revision of the Test Code Section of its Standards.

This Test Code Section, first published in 1936, contains specific recommendations for the testing of centrifugal and rotary pumps, both for acceptance tests in the field, and in the plant of the pump manufacturer.

The Code contains the limiting conditions for all methods of quantitative determination of capacity, head, and power input, whereby the accuracy for an acceptance test can be obtained.

Copies may be secured from Hydraulic Institute, 90 West Street, New York 6, New York, at 50¢ per copy, payable in advance.

Victory Maintenance Plan Prepared for Diesel Electric Plants

To keep essential power-generating plants operating at maximum output, the "Victory Maintenance Plan for Diesel Electric Plants" has been developed through the cooperative effort of the Diesel engine manufacturers and the Westinghouse Electric and Manufacturing Company.

As most municipal plants are operating both regular and standby units at full capacity, proper maintenance is now imperative. All possible steps should be taken to prevent breakdowns or emergency repairs. As a contribution to better and more adequate maintenance programs for Diesel engines and generators, Westinghouse consulted engine builders for assistance in the preparation of this information so that a combined plan for the units could be established. Copies of this Victory Maintenance Plan may now be secured from the Diesel engine manufacturers.

Prepared as a portfolio, this plan includes an 18-page Operating Guide booklet that covers complete information on the necessary steps for maintenance and inspection programs, Mechanical and Electrical Check Charts based on frequency of Inspection and a sample form of a recommended Diesel Engine Operating Log which, when filled out, will serve to determine the proper scheduling of inspection intervals to meet individual plant requirements.

Flexible Pavement Reaction Under Field Load Bearing Tests

With the above title, The Asphalt Institute, under the authorship of its Chemical Engineer, Prevost Hubbard, presents an interesting new load-bearing study, including a series of Settlement and Deflection charts, for use in the course of establishing a true evaluation of both the actual and relative load carrying capacities of different flexible pavement designs.

The scope of this brief twelve-page pamphlet study is indicated by its four marginal subheadings, as follows: (1) Previous Field Tests Confusing; (2) Settlement and Deflection Factors; (3) Analysis of Initial Settlement Factor Essential; (4) Suggested Procedure for Making Field Load Bearing Test.

Copies of this new publication, designated Research Series No. 9, are available without charge upon request to The Asphalt Institute, 801 Second Avenue, New York, N. Y.

Serviron, a Plastic Coating

Saverite Engineering Co.
Hoboken, N. J.

In a new bulletin this product is described and its uses explained. The manufacturers say: Serviron protects metal, wood and concrete storage tanks and water-submerged surfaces against corrosion and fungus growths; that it doesn't dry hard but stretches and contracts with temperature changes; it will not melt, freeze, crack or peel at temperatures from below freezing to 500-550°F. Bulletin available upon request.

How Lubricants Speed Production

Swan-Finch Oil Corporation
R.C.A. Building, West, New York N. Y.

In a new booklet, "90 Years of Industrial Pioneering," the progress in development of lubricating oils and how these products are helping to win the war are clearly presented.

Many of the old industrial prints reproduced will be of interest to collectors. Copies will be sent upon request on firm letterhead.

A New Booklet on Diesel Engines

Fairbanks, Morse & Co.
606 South Michigan Ave.
Chicago 5, Ill.

This booklet includes particulars on design, manufacture and service facilities applicable to stationary Fairbanks Morse Diesels. A looseleaf supplement sheet gives detailed operating cost data for typical municipal plants. The list includes 26 municipalities of a population from 1000 to 17,500 in which the cost is approximately ¾¢ per kwh. Requests written on official letterheads will bring a copy of this interesting booklet.

Austin-Western Wins Army-Navy "E" Award

For a conspicuous job in turning out various products, some of which had never been built before; for making parts so accurate that they interchanged with units in the field and those made by other companies; and for using old equipment (some discarded by other users and dating back to World War I days) and making them work even better than before, saving Uncle Sam the expense of buying new machines, the Austin-Western Road Machinery Co.'s organization of Aurora, Illinois, was awarded the coveted "E" pennant and each employee, an "E" pin.

Among the products produced for the war effort are such items as caissons, ammunition wagons, tank parts, motorized sweepers for airbases, graders and rollers for road construction and maintenance, shovels and cranes, dump and trail cars for handling ore and stone, crushing and screening equipment and 155 M.M. howitzer carriages. The latter, a heavy piece of artillery credited with a major role in the conquest of Tunisia, is pictured with barrel in position in the accompanying view. The unit weighs approximately 4½ tons; can be drawn by truck at 50 m.p.h., and can fire a 95-lb. shell at a range exceeding 12,000 yards.

In awarding the pennant and speaking to a huge assemblage of employees, guests and company officials, from a decorated platform banked with flowers, Lt. Col. G. V. Rountree declared: "Austin-Western has met all delivery schedules with no rejections to date." "The Army appreciates this work and will use it to the best advantage." Remarks were also made by Lt. Regi-

This war doesn't have to last forever. We can shorten it considerably. We can get it over quickly . . . if we do all that is expected of us. This means investments . . . heavy investments . . .in War Bonds. For the more money we can turn into equipment for Victory, the sooner we can get back to the delivery of equipment you need for your work . . . Homelite Portable Generators, for example, better than ever before.

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Every Homelite worker is buying War Bonds regularly And every Homelite worker is doing everything possible to speed Victory through ever-increasing production.

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nald Rader, U.S.N., in presenting pins to representative employees and token pins to representative employees and those with long service records.

OTHER "E" AWARDS

Badger Meter Mfg. Co.

The Army-Navy "E" production award was made on Friday, June 18, 1943, to the Badger Meter Manufacturing Company, Milwaukee, Wisconsin.

Presentation of the flag was made by Maj. Frederick D. Hansen, officer in charge, Milwaukee office, Chicago Ordnance District; and a speech of acceptance was given by C. W. Wright, President of the company. Lt. Com. M. E. Fraser, assistant resident inspector of Naval materials, presented representative employees with lapel pins. Later, all 800 employees received silver lapel pins and individual certificates of merit.

Second Renewal of Navy "E" Award

The Navy Board for Production Awards has granted to the DeLaval Steam Turbine Co., Trenton, N. J., builders of gears and turbines for marine propulsion, centrifugal pumps, rotary oil pumps, and centrifugal compressors, a second renewal of the right to fly the Navy "E" flag with two white stars as a symbol of excellence in production.

Baker Mfg. Co.

Army-Navy "E" Award was made to the Baker Manufacturing Company, Springfield, Ill., on July 28th. The award and the Army-Navy "E" burgee were presented by Col. H. W. Hastings, U.S.A., Chief of Production, Branch Office of Division Engineer, Great Lakes, Ill., who delivered the principal address. They were received by W. C. Staley, President of the company. Lt. Comm. H. B. Freeman, U.S.N.R., Resident Inspector of Naval Materiel, St. Louis, Mo., presented the employees' pins. They were accepted for the workers by Henry L. Hayes, President, C.I.O. Local No. 2207, United Steel Workers. In his presentation Col. Hastings pointed out that "the hardest work still lies ahead, and there remains much fighting for both the soldiers of war and the soldiers of production." Mr. Staley, in accepting the honor, said, "Our job is not done and our goal is not yet reached. We shall keep on until ultimate victory is achieved."

D. D. Foster Appointed Sales Head at Pittsburgh Equitable Meter Co.

Major A. E. Higgins, Vice President of the Pittsburgh Equitable Meter Company, who is now in active service in the Army Air Corps, announces the appointment of Donald D. Foster as Assistant Sales Manager.

Mr. Foster formerly was District Manager for the Pittsburgh territory. In his new capacity he will be acting head of the Sales Division for both the parent concern and subsidiary, the

D. D. Foster

Merco Nordstrom Valve Company. He is a native of Pittsburgh and a graduate of Carnegie Institute of Technology.

H. K. Porter Co., Inc., Pittsburgh, Pa., Purchases Quimby Pump Co. with Plants at Newark and New Brunswick, N. J.

Established before the turn of the century, Quimby Pump Co. manufactures a full line of pumps, including screw, centrifugal and retex types. At present the company is also building considerable quantities of pumps for both the Navy and Maritime Commission.

The Quimby plants will be operated as a division of H. K. Porter Co., Inc., a manufacturer of industrial locomotives and chemical processing equipment, the President, T. M. Evans, said. The purchase was made in order to further diversify H. K. Porter Co., Inc.'s line of products.

Peake Promoted by Mathieson

The Mathieson Alkali Works (Inc.), New York, N. Y., announces the appointment of J. B. ("Jun") Peake, formerly New York District Sales Manager, to the post of Assistant General Manager of Sales. In his new capacity, Mr. Peake will be assistant to D. W. Drummond, General Manager of Sales.

Willard Allis-Chalmers Director

Leigh Willard, once an Allis-Chalmers draftsman, was elected a company director at the annual Allis-Chalmers stockholders meeting held in May. Willard will fill the vacancy left on the board by the death of Max W. Babb. The new director is also president and director of the Interlake Iron Corp., the largest producer of merchant pig iron in the nation, with substantial interests in iron and coal mines.

Electronics in Industry

There are many definitions of the word electronics. One definition is: electronics is the application of devices in which the flow of free electrons are made to perform such numerous functions or duties, as to rectify, amplify, generate, control, convert light into current and current into light. The necessary tubes may take the form of diodes, triodes, ignitrons, pentodes, beam power tubes, thyratrons, phana-

trons, kenatrons, photo tubes, cathode ray tubes and so on. A brief study of the application of these hundreds of types of tubes shows that the science of electronics is not new. It also shows that the future possibilities are extremely important in that hardly a week passes without the development of new tube types or new combinations of tubes and circuits to perform new functions.

To promote the use of electronics in industry on a broad engineering and commercial basis, Westinghouse has established a group of electronic engineers who will guide and direct the industrial, central station and transportation electronic applications. This new central organization will supplement the Company's present electronic divisions with specialized activity such as control, radio, lamps, and power conversion.

This step in centralization has been taken by Westinghouse to accomplish three primary objectives: first, to expedite present wartime applications of electronic devices; second, to be able to utilize to the fullest extent the present developments for post-war applications; third, to make immediately available to all other industries the developments and improvements found practical in one industry. The various industry engineering sections will retain the responsibility for making specific applications within their industry.

Two senior engineers, Gordon F. Jones and Carl J. Madsen will head the Industry Engineering group, while Amos J. Germain will be in charge of the Industrial Department activities.

Association Meetings

September 28 and 29 — NEW ENGLAND WATER WORKS ASSOCIATION, Hotel Statler, Boston.

Sept. 30-Oct. 1 — NEW YORK SECTION A.W.W.A. War Conference, Hotel Arlington, Binghamton, N. Y.

October 5-7—NORTH DAKOTA WATER AND SEWAGE WORKS, Grand Forks, Ryan Hotel, R. M. Jensen, Supt. W. W.—Chairman.

October 11-13 — SOUTHWEST SECTION A.W.W.A., Biltmore Hotel, Oklahoma City.

October 12-14—AMERICAN PUBLIC HEALTH ASSOCIATION — 72nd annual meeting, New York, N. Y., Hotel Pennsylvania.

October 15-16 — FOUR STATES SECTION A.W.W.A. annual meeting, Benjamin Franklin Hotel, Philadelphia.

October 21-23 — FEDERATION OF SEWAGE WORKS ASSOCIATIONS, Sherman Hotel, Chicago.

October 24-27—Streamlined American Public Works Association meeting will be held at Hotel Sherman, Chicago.

October 27-28 — CALIFORNIA SECTION A.W.W.A., Biltmore Hotel, Los Angeles.

November 1-3 — NORTH CAROLINA SECTION A.W.W.A., Winston-Salem, Hotel Robert E. Lee.

North Dakota Provides for Registering Professional Engineers

The act was passed by the 1943 legislature, approved by the Governor, and went into effect July 1st. North Dakota is the 46th state to require registration of engineers.

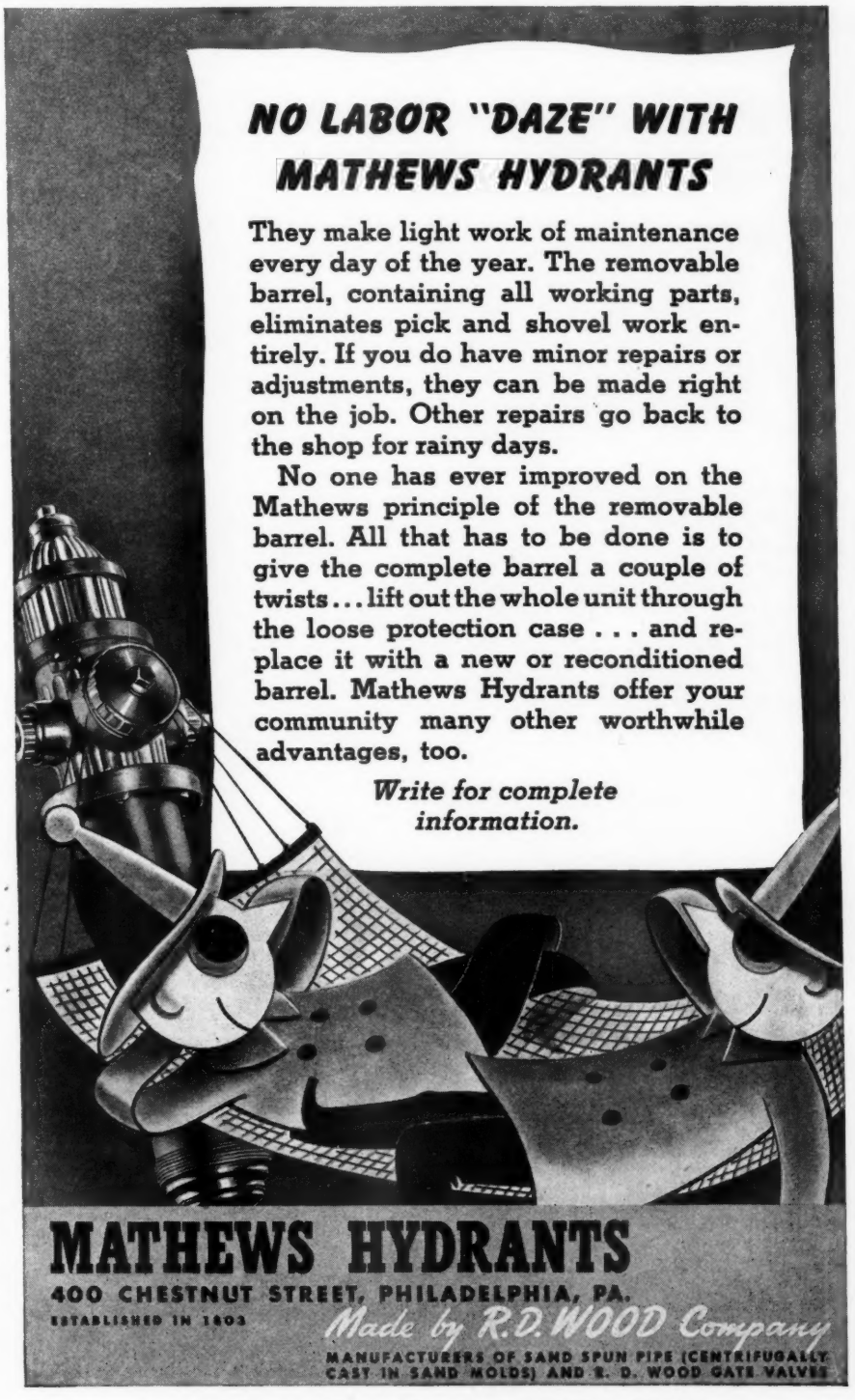
The preparation, introduction and passage of the act resulted largely from efforts of the North Dakota Society of Professional Engineers, which was organized in 1940. It conforms quite closely to the model law which has been approved by nearly all of the national and regional engineering societies.

Governor John Moses has appointed Jay Wesley Bliss, City Manager, Minot; Alexander Carothers Burr, Consulting Engineer, Jamestown; and Clifford Johnson, Bridge Engineer, State Highway Department, Bismarck, to the three-member State Board of Registration for Professional Engineers.

Meter Company Executives Serve Country

Four of the top executives of the Pittsburgh Equitable Meter Company, Pittsburgh, Pennsylvania, are now active participants in various branches of Governmental Service.

Colonel Willard F. Rockwell, President, who has been in the Army Reserve over twenty years, has been serving as Director of Production for U. S.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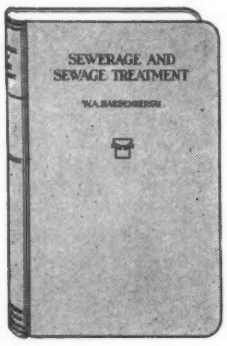

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Sewerage and Sewage Treatment

By COL. W. A. HARDENBERGH

Here is a bigger and better book than the earlier edition which proved so popular with sanitary engineers everywhere. The section on treatment has been entirely rewritten and design examples of all kinds worked out in detail to illustrate practical and up-to-date methods of design.

For the Average Engineer

Like its predecessor, this is an authoritative yet simple treatment of the subject by one of the nation's foremost authorities. Col. Hardenbergh's editorial and field work have brought him in close contact with the problems that trouble the average engineer and in this book he outlines those methods most suitable for handling the work. Particular attention is paid to sewerage systems, both storm and sanitary.

Partial Table of Contents

Hydraulics of Sewers
Planning Sewerage Systems
Design of Sanitary Sewers
Design of Storm and Combined Sewers
Pumping of Sewage
Fundamentals of Sewage Treatment
Grit Removal and Screening
Sedimentation
Chemical Treatment of Sewage
Activated Sludge Process
Secondary Treatment of Sewage
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Institutional Waste Treatment
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Maritime Commission in Washington, D. C., since April 7, 1942. He was appointed to this post on the recommendation of General Knudsen and at the request of Admiral Emory S. Land, Chairman of the Commission. In this capacity, he is in charge of the production requirements for cargo vessels ordered by the Commission and must see that schedules are maintained. He is a member of the Executive Committee of the Army and Navy Munitions Board, the Material Requirements Committee and Scheduling Committee of the W.P.B., as well as serving on numerous other committees.

Allen D. MacLean, Vice President and Chief Engineer, is also in Washington with the Maritime Commission serving as Assistant Director of Production.

Private W. F. Rockwell, Jr., Vice President and Comptroller, is in training at the Army Ordnance Officers' School, Aberdeen Proving Grounds, Aberdeen, Maryland.

Captain A. E. Higgins, Vice President and Sales Manager, a Reserve Officer of many years standing, was on May 8th commissioned Major and assigned to active duty with the U. S. Air Corps.

Raymond M. Simon

Raymond M. Simon, age forty eight, New England representative of R. D. Wood Company, died at his home in Worcester, Mass. on Tuesday, May 18th. He was a native of Philadelphia, a veteran of World War One, and had been in the employ of R. D. Wood Company for the past thirty

George Cobb

Mr. Cobb had been chief engineer of the city of Baltimore since 1939. He was injured Monday, June 13th, in an automobile accident and died the 17th in Union Memorial Hospital, at the age of 53.

As chief engineer Mr. Cobb was a member of the Board of Estimate, the policy making body of the municipality. He also was head of the Department of Public Works and ex officio member of the City Plan Commission.

RECENT APPOINTMENTS

New City and County Officials recently reported:

City Engineers

J. N. Boles, Antioch, Calif.
John H. Griffiths, Nampa, Idaho
J. M. Weir, Decatur, Ill.
J. H. Cosby, Cambridge, Md.
Hugh Danahy, Hibbing, Minn.
Baldwin & Cornelius, Freeport, N. Y.
S. Sherk Miller (Acting), Lebanon, Pa.
David F. LaPrade, Jr., Hopewell, Va.

City Managers

W. C. Drager, Fernandina, Fla.
C. W. Frost, Belfast, Me.
Byron A. Robinson, Bellows Falls, Vt.

Director Public Service

Albert L. Schuster, Parma, Ohio

Water Works Superintendents

J. H. Spillyards, Newport, Ark.
H. P. Stewart, Stuttgart, Ark.
R. A. Samson, Brighton, Colo.
Willard T. Rennels, Charleston, Ill.
Richard B. Corns, Elkhart, Ind.
Robert T. Johnson, Knoxville, Iowa
Robert Cappell, Plattsmouth, Nebr.
J. B. Massa, Pampa, Tex.
Kenneth Hickman, Colfax, Wash.

County Engineers and Officials

Charles W. Angelo, Woodruff Co., Augusta, Ark.
H. J. White, Yell Co., Danville, Ark.
F. L. Grady, Prairie Co., Des Arc, Ark.
George F. Caudle, Washington Co., Fayetteville, Ark.
Charles Fleming, St. Francis Co., Forrest City, Ark.
Clarence Freeze, Craighead Co., Jonesboro, Ark.
W. E. Billingsley, Izard Co., Melbourne, Ark.
J. F. Averitt, Polk Co., Mena, Ark.
James A. Ross, Drew Co., Monticello, Ark.
Olen Fullerton, Conway Co., Morrillton, Ark.
Tom Jackson, Pike Co., Murfreesboro, Ark.
Elam Turner, Perry Co., Perryville, Ark.
John Terry, Clay Co., Piggott, Ark.
Doyle Blackburn, Fulton Co., Salem, Ark.
S. M. Denniston, Crawford Co., Van Buren, Ark.
Gene Davidson, Scott Co., Waldron, Ark.
Fred W. Keifer, Bingham Co., Blackfoot, Idaho
Walter H. Hill, Idaho Co., Grangeville, Idaho
R. H. Mann, Nez Perce Co., Lewiston, Idaho
Carl M. Westerberg, Jefferson Co., Rigby, Idaho
Arthur Tiggelbeck, Bonner Co., Sandpoint, Idaho
R. H. Dunn, Shoshone Co., Wallace, Idaho
Burt K. Preston, Will Co. (Acting), Joliet, Ill.
Ralph McKernon, Washington Co. (Deputy), Hudson Falls, N. Y.
George E. Havens, Yates Co., Penn Yan, N. Y.
Harry T. Tuthill, Suffolk Co., Port Jefferson, N. Y.
John Nimsker, Wyoming Co. (Deputy), Warsaw, N. Y.
Donald Child, Tama Co., Toledo, Ohio
D. W. C. Nelson, Baker Co., Baker, Ore.
Wm. Merritt, Grant Co., Canyon City, Ore.
H. P. Barrows, Washington Co., Hillsboro, Ore.
David C. Slaght, Columbia Co., St. Helens, Ore.
John E. Groen, Douglas Co., Armour, S. D.
A. B. Christenson, Marshall Co., Britton, S. D.
Charles Endicott, Custer Co., Custer, S. D.
Fay C. Munger, Kingsbury Co., De Smet, S. D.
Ed. Cox, Moody Co., Flandreau, S. D.
Clarence Satter, Hamlin Co, Hayti, S. D.
H. E. Woodruff, McPherson Co., Leola, S. D.
Elmer Wilson, Roberts Co., Sisseton, S. D.
Mahlon Beels, Tripp Co, Winner, S. D.
R. W. Gibbons, Tarrant Co., Fort Worth, Tex.
F. M. Yellott, Frederick Co., Winchester, Va.
James Dodson, Grant Co., Ephrata, Wash.
T. F. Rixon, Clallam Co., Port Angeles, Wash.
Ernest W. Emrick, Ritchie Co., Cairo, W. Va.
O. H. Calohan, Hampshire Co., Romney, W. Va.
S. P. D. Tierney, Lewis Co., Weston, W. Va.

Charles H. Sells of Westchester Co., N. Y. has been appointed State Supt. of Public Works, succeeding Capt. Arthur W. Brandt.

L. D. Pierce, Osage Co., Lyndon, Kan.
C. T. Morhbacher, Marshall Co., Marysville, Kan.
Jack Lewallen, Logan Co., Russell Springs, Kan.
Erie Classen, Stafford Co., St. John, Kan.
Geo. Heinig, Sedgwick Co., Wichita, Kan.
John Bush, Warren Co., Bowling Green, Ky.
Bud Dobson, Knott Co., Hindman, Ky.
Wilson Baker, Leslie Co., Hynden, Ky.
Earl Pickerell, Grayson Co., Leitchfield, Ky.
Walter Young, Bell Co., Pineville, Ky.
B. F. Cole, Alen Co., Scottsville, Ky.
Evan Martin, Grant Co., Williamstown, Ky.
Alvin E. Hotard, Jefferson Parish, Gretna, La.
C. A. Bell, Lafayette Parish, Lafayette, La.
Joseph Pugh, St. Tammay Parish, Mandeville, La.
W. H. Hucaby, Ouachita Parish, Monroe, La.
Joe Abramson, Caddo Parish, Shreveport, La.
C. A. Sparling, Madison Parish, Tallulah, La.
Arthur Nielson, Harford Co., Bel Air, Md.
Walter L. Hull, Garrett Co., Oakland, Md.
Joseph Thompson, Baltimore Co., Towson, Md.
P. J. Walsh, Carroll Co., Westminster, Md.
Wallace S. Carson, Norfolk Co., Dedham, Mass.
Howard S. Hatch, Middlesex Co., East Cambridge, Mass.
Clinton C. Barker, Essex Co. (Acting), Salem, Mass.

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Readers' Service Department

These booklets are FREE but distribution is restricted to those actively engaged in engineering or construction. Use the coupon below or write the manufacturer direct, mentioning PUBLIC WORKS.

Construction Materials and Equipment

Air Raid Shelters

3. New 8 page booklet pictures and describes a corrugated pipe shelter with gas tight end walls, emergency escape tunnel and other desirable features. Armco Drainage Products Assn., Middletown, Ohio.

Bridges

7. Teco Connectors, a new method of structural engineering, to spread the load on a timber joint more equally over the cross-section of the wood is described in new literature available from Timber Engineering Co., Dept. BS-2, 1319—18th St., N. W., Washington, D. C.

Cement Dispersion

9. "Economics of Cement Dispersion and Pozzolith" tells the complete story of how cement dispersion reduces water required up to 20% and increases workability 150%. Write The Master Builders Co., Cleveland, Ohio, for a copy.

Cold Mix Plants

15. New catalogs and prices of Portable Bituminous Mixers in 6 to 14 ft. sizes for resurfacing and maintenance. Issued by The Jaeger Machine Co., 400 Dublin Ave., Columbus 16, Ohio.

Cold or Wet Weather Construction

18. Cleaver Aggregate Heaters and Dryers, Hot Water Boosters, and Automatic Steam plants are designed to speed up cold or wet weather construction. Write for illustrated bulletins. Cleaver-Brooks Co., 3112 W. Center St., Milwaukee, Wis.

Concrete Accelerators

31. New 48-page booklet in five sections explains clearly the effects, advantages and methods of using Calcium Chloride and Portland Cement mixes. Complete and packed with practical information; well illustrated; pocket size. Sent free on request by Solvay Sales Corp., 40 Rector St., New York, N. Y.

Concrete Curing

33. 64-page manual of concrete curing with calcium chlorides. Complete, handy. Contains useful tables, well illustrated. Write the Columbia Chemical Division, Pittsburgh Plate Glass Co., Grant Bldg., Pittsburgh, Pa.

Concrete, Early Strength

38. 64-page manual tells how to speed up year 'round concreting, shows how to secure high early strength and greater workability at temperatures either below or above freezing. Contains many actual examples of practical concreting operations; well illustrated with more than 60 photos, charts, graphs and tables. Calcium Chloride Assn., Penobscot Building, Detroit 26, Mich.

Concrete Mixers

44. Catalog and prices of Concrete Mixers, both Tilting and Non-Tilt types, from 3½S to 56S sizes. The Jaeger Machine Company, 400 Dublin Ave., Columbus 16, Ohio.

Drainage Products

70. Standard corrugated pipe, perforated pipe and MULTI PLATE pipe and arches — for culverts, sewers, subdrains, cattlepasses and other uses are described in a 48-page catalog entitled "ARMCO Drainage Products," issued by the Armco Drainage Products Association, Middletown, Ohio, and its associated member companies. Ask for Catalog No. 12.

Forms, Steel

90. Steel forms for Highways, Sidewalks and Airports, to keep pace with ever changing conditions are covered in two new bulletins containing complete specifications. Write Heltzel Steel Form & Iron Co., Warren, Ohio.

Graders, Patrol

105. The Austin-Western 99M Power Grader with its powerful all wheel drive simplifies all construction and maintenance; handles difficult jobs with economy and efficiency; and does better work on grading, ditching, scarifying, snow plowing, loading, mixing, bulldozing, shoulder trenching and backsloping. Write for Bulletin 1946. Austin-Western Road Machinery Co., Aurora, Ill.

Mixing Plants, Asphalt

106. The Cleaver Asphalt Mixing Plant for an inexpensive plant mix and the Cleaver Tank Car Heater and Bituminous Booster are covered in illustrated catalogs sent on request by Cleaver-Brooks Co., 3112 W. Center St., Milwaukee, Wis.

Mud-Jack Method

107. How the Mud Jack Method for raising concrete curb, gutter, walls and street solves problems of that kind quickly and economically without the usual cost of time-consuming reconstruction activities — a new bulletin by Koehring Company, 3026 West Concordia Ave., Milwaukee, Wis.

Oil, Motor

109. "Here's Proof of Ring-Free Superiority," 32 pages, illustrated, outlines the principles of lubrication and explains how by simple tests you can measure the advantages of Macmillan Ring-Free Motor Oil. Write Macmillan Petroleum Corp., 530 West 6th St., Los Angeles, Calif.

Paving Materials, Bituminous

111. New "Tarvia Manual" is packed with useful data on how to build and maintain roads with Tarvia. Each step is illustrated with excellent action pictures. 64 pp. 103 ills. Write to The Barrett Div., 40 Rector St., New York, N. Y.

Pumps

120. Interesting new booklet tells how to lengthen the life of your pumps. Explains how a little care will save a lot of wear. Write today for your copy. Homelite Corp., 2403 Riverdale Ave., Portchester, N. Y.

121. New illustrated catalog and prices of Jaeger Sure Prime Pumps, 2" to 10" sizes, 7000 to 220,000 G.P.H. capacities, also Jetting, Caisson, Road Pumps, recently issued by The Jaeger Machine Company, 400 Dublin Ave., Columbus 16, Ohio.

123. New brochure by Gorman-Rupp Co., Mansfield, Ohio, illustrates and describes many of the pumps in their complete line. Covers heavy duty and standard duty self-priming centrifugals, jetting pumps, well point pumps, triplex road pumps and the lightweight pumps.

124. 16-page illustrated bulletin, SP-37, describes and illustrates complete C. H. & E. line of self-priming centrifugal pumps from ½" to 8", including lightweight models for easy portability. C. H. & E. Mfg. Co., 3841 No. Palmer St., Milwaukee, Wis.

Road Building and Maintenance

128. Motor Patrol Graders for road maintenance, road widening and road building, a complete line offering choice of weight, power, final drive and special equipment to exactly fit the job. Action pictures and full details are in catalogs Nos. 253, 254 & 255, issued by Galion Iron Works & Mfg. Co., Galion, Ohio.

Rock Drill Maintenance

130. New booklet presents through amusing cartoons useful hints on proper rock drill maintenance methods—what your men can do to get more work out of your tools with a minimum of expense for repairs and compressed air. Write The Cleveland Rock Drill Co., 3734 East 78th St., Cleveland, Ohio.

Rollers

133. New Tu-Ton roller of simple construction for use in rolling sidewalks along highways, playgrounds and other types of light rolling is fully described in a bulletin issued by C. H. & E. Mfg. Co., 3841 No. Palmer St., Milwaukee, Wis.

138. "The Buffalo-Springfield line of road rollers (tandem, 3-wheel, and 3-axle) are described in the latest catalog issued by the Buffalo-Springfield Roller Co., Springfield, Ohio."

139. "Ironeroller" 3 Axle Roller for extra smooth surfaces on all bituminous work. Booklet contains roller data and operation details. Hercules Co., Marion, Ohio

140. This well-illustrated 16-page catalog describes the tandem, autocrat, cadet, and roll-a-plane rollers, and explains what each is intended to accomplish. Write Austin-Western Road Mach. Co., Aurora, Ill.

Rotproofing

145. Cuprinol, a rotproofing chemical that protects wood from fungi and insects, yet has no offensive odor, is non-poisonous, does not corrode metal and can be painted over. Get full details in booklet from Cuprinol, Inc., 7 Water St., Boston, Mass.

Soil Stabilization

150. "High-Service, Low Cost Roads" is one of the newer booklets using an effective combination of picture and text to set forth the principles and advantages of road surface stabilization with calcium chloride. Complete, interesting and well illustrated. 34 pages. Sent by Solvay Sales Corp., 40 Rector St., New York, N. Y.

152. The Columbia Chemical Division will be glad to furnish to anyone interested complete information dealing with Calcium Chloride Stabilized Roads. This literature contains many charts, tables and useful information and can be obtained by writing Columbia Chemical Div., Pittsburgh Plate Glass Co., Grant Bldg., Pittsburgh, Pa.

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154. **"Soil Stabilization with Tarvia"**—An illustrated booklet describing The steps in the stabilization of roadway soil with Tarvia will be mailed on request by The Barrett Div., 40 Rector St., New York, N. Y.

Spreader

187. Jaeger Paving equipment, including Mix-in-Place Roadbuilders, Bituminous Pavers, Concrete Bituminous Finishers, Adjustable Spreaders, Forms, etc.—4 complete catalogs of latest equipment in one cover, issued by The Jaeger Machine Company, 400 Dublin Ave., Columbus 16, Ohio.

Surface Consolidation and Maintenance

188. Detailed and illustrated presentation of the method and procedure in consolidated operations; explains how sub-soils can be conditioned to resist softening and frost action; how surfacing can be consolidated to provide smooth all-weather riding surfaces; how they can be maintained so as to prevent disintegration and gravel loss. Write the Calcium Chloride Association, Penobscot Bldg., Detroit 26, Mich., for Bulletin No. 29.

Timber Structures

189. "Typical Designs of Timber Structures" contains plans for 45 representative structures that have been engineered with Teco Connectors. For free copy write Timber Engineering Co., Inc., Room 6GG, 1319—18th St., N. W., Washington, D. C.

Well Points

195. New complete catalog, "Griffin Pointed Wellpoint Facts," just issued. Covers pre-drainage, describing wellpoints jetting pumps, with tables, diagrams and illustrations. Griffin Wellpoint Corp., 881 E. 141st St., New York.

Street and Paving Maintenance

290. "Blacktop Road Maintenance and Construction Equipment"—Asphalt and tar kettles, flue type kettles, spray attachments with completely submerged pumps, tool heaters, surface heaters, road brooms, portable trail-o-rollers, etc. These are all described in detail and illustrated. This modern and up-to-date equipment for blacktop airport and road construction and maintenance is based upon experience and engineering research over a period of 42 years. Write for Catalog R. Littleford Bros., Inc., 452 East Pearl St., Cincinnati 2, O.

Fire Apparatus

300. Detailed information and advice about specially engineered Ward LaFrance apparatus will be sent on request. Ward LaFrance Div., Elmira, N. Y.

Snow Fighting

Snow Plows

350. "Frink One-Way Sno-Plows" is a four page catalog illustrating and describing 5 models of One-Way Blade Type Sno-Plows for motor trucks from 1½ up to 8 tons capacity. Interchangeable with V Sno-Plow. Features, specifications and method of attaching. Carl H. Frink, Mfr., Clayton, 1000 Islands, N. Y.

Ice Control

351. "Make Icy Highways Safe for Traffic"—a new bulletin by Michigan Alkali Div., Wyandotte Chemicals Corp., Wyandotte, Mich., tells how to use calcium chloride for modern ice control.

Sanitary Engineering

Aero-Filter

356. "Results Produced by Aero-Filters" is a new pamphlet covering results at Temple, Texas; Paris, Ill.; Webster City, Iowa; and Mason, Mich. Write Lakeside Engineering Corp., 222 West Adams St., Chicago, Ill.

Air Release Valves

357. Automatic Air Release Valves for water, sewage and industrial uses are described and illustrated in new catalog issued by Simplex Valve & Meter Co., 6750 Upland St., Philadelphia, Pa.

Analysis of Water

360. "Methods of Analyzing Water for Municipal and Industrial Use" is an excellent 94 page booklet with many useful tables and formulas. Sent on request by Solvay Sales Corp., 40 Rector St., New York, N. Y.

Activation and Aeration

376. A valuable booklet on porous diffuser plates and tubes for sewage treatment plants. Covers permeability, porosity, pore size and pressure loss data, with curves. Also information on installations, with sketches and pictures, specifications, methods of cleaning and studies in permeability. 20 pp. illustrated. Sent on request to Norton Company, Worcester, Mass.

Blowers

378. All interested in low cost air for sewage disposal will want a copy of this catalog describing operating principles and specifications of Roots-Connersville Aerating Blowers. Write to Roots-Connersville Blower Corp., 301 Valley Ave., Connersville, Ind.

Chlorinators, Portable

379. Complete data on new portable chlorinator designed to meet emergency calls quickly and efficiently. Write Wallace & Tiernan Co., Inc., Newark 1, N. J.

380. "Emergency Sterilization Equipment," a new bulletin describing the advantages of Dual Drive Chlor-O-Feeders which can serve as either a permanent chemical feeder or as a portable emergency chlorinator. Order from Proportioneers, Inc., 96 Codding St., Providence, R. I.

Cleaning Sewers With Own Forces

381. A 20-page booklet describes and illustrates a full line of sewer cleaning equipment—Rods, Root Cutters, Buckets, Nozzles and Flushers. Write W. H. Stewart (Pioneer Mfr. since 1901), Jacksonville, Fla., or P. O. Box 767, Syracuse, N. Y.

Cleaning Mains

383. 32-page illustrated booklet explains how a city can clean its sewers and culverts with its own forces using the up-to-date Flexible Sewer Rod equipment. Illustrates and describes all necessary equipment. Issued by Flexible Sewer Rod Equipment Co., 9059 Venice Boul., Los Angeles, Calif.

Consulting Engineers

384. "Who, What, Why" outlines briefly the functions of the consulting chemist and chemical engineer. Covers various methods of cooperation, on different types of problems, with industry, with attorneys and with individuals. Foster D. Snell, Inc., 305 Washington St., Brooklyn, N. Y., will send a copy on request.

Feeders, Chlorine, Amonia and Chemical

385. For chlorinating water supplies, sewage plants, swimming pools and feeding practically any chemical used in sanitation treatment of water and sewage. Flow of water controls dosage of chemical; reagent feed is immediately adjustable. Starts and stops automatically. Literature from % Proportioneers, Inc. % 96 Codding St., Providence, R. I.

386. New circular describes and illustrates the Var-I-Feeder, a new portable chemical feeder for water main sterilization, military use or other chemical treatment. Write Chem-Feeds, Inc., 77 Reservoir Ave., Providence, R. I.

387. Everson Sterelators for all kinds of chemical feeding in stationary and portable models are described in new bulletins issued by Everson Manufacturing Co., 214 West Huron St., Chicago 1, Ill.

Filters

388. How to increase the capacity of filters through use of Anthrafilt and complete data on use of Anthrafilt for filters and sludge beds is contained in a revised pocket Manual issued by Anthracite Equipment Corp. For free copy write H. G. Turner, State College, Pa.

Fire Hydrants

390. Specifications for standard AWWA fire hydrants with helpful instructions for ordering, installing, repairing, lengthening and using. Issued by M & H Valve & Fittings Co., Anniston, Ala.

391. See listing No. 410.

Flow Meters

392. The primary devices for flow measurement—the orifice, the pilot tube, the venturi meter and others—and the application to them of the Simplex meter are described in a useful 24-page booklet (42A). Simplex Valve and Meter Co., 6750 Upland St., Philadelphia, Pa.

Gas Holders and Digesters

393. Clarifiers, sludge digesters and other tanks and gas holders for sludge gas. Graver Tank & Mfg. Co., Inc., 332 So. Michigan Ave., Chicago, Ill.

Gates, Valves, Hydrants

394. Gate, flap and check valves; floor stands and fittings. New catalog No. 34 gives detail information with dimensions for all types of new full line. M. & H. Valve & Fittings Co., Anniston, Ala.

395. Complete booklet with much worthwhile water works data describes fully Ludlow hydrants and valves. Sent on request. Ludlow Valve Mfg. Co., Troy, N. Y.

396. See listing No. 410.

Gauges

398. The full line of Simplex gauges for filtration plants are illustrated and described in catalog issued by Simplex Valve and Meter Co., 6750 Upland St., Philadelphia, Pa.

Laboratory Equipment

403. pH and Chlorine Control. A discussion of pH control and description of comparators, chlorimeters and similar devices. An 80-page booklet. W. A. Taylor & Co., 7301 York Road, Baltimore, Md.

Maintenance

404. "The Lubriplate Way" contains much valuable information on long-lasting Lubriplate lubricants which are especially adapted for difficult conditions such as parts that are immersed in sewage, water or steam. Write Lubriplate Division of Fiske Brothers Refining Co., 129 Lockwood St., Newark, N. J.

Manhole Covers and Inlets

405. Street, sewer and water castings in various styles, sizes and weights. Manhole covers, water meter covers, adjustable curb inlets, gutter crossing plates, valve and lamphole covers, ventilators, etc. Described in catalog issued by South Bend Foundry Co., Lafayette Boul. and Indiana Ave. South Bend, Ind.

Meters, Venturi

406. New bulletin illustrates Builders Air Relay system of transmission for the Venturi Meter which is particularly useful for liquids containing suspended solids like sewage. Eliminates corroson, clogged pipes, etc. Write Builders-Providence, Inc., Codding St., Providence, R. I.

Pipe, Cast Iron

408. Handbook of Universal Cast Iron Pipe and Fittings, pocket size, 104 pages, illustrated, including 14 pages of useful reference tables and data. Sent by The Central Foundry Co., 386 Fourth Ave., New York 16, New York.

409. Cast iron pipe and fittings for water, gas, sewer and industrial service. Super-deLavaud centrifugally-cast and pit-cast pipe. Bell-and-spigot, U. S. Joint, flanged or flexible joints can be furnished to suit requirements. Write U. S. Pipe and Foundry Co., Burlington, N. J.

410. "Cast Iron Pipe and Fittings" is a well illustrated 44 page catalog giving full specifications for their complete line of Sand Spun Centrifugal Pipe, Fire Hydrants, Gate Valves, Special Castings, etc. Will be sent promptly by R. D. Wood Co., 400 Chestnut St., Philadelphia, Pa.

Pipe, Lock Joint

412. Lock Joint Reinforced Concrete Sewer Pipe. Pressure Pipe, Culvert Pipe, Centrifugal Pipe and Subaqueous Pipe is described and illustrated in bulletins available from Lock Joint Pipe Co., Ampere, N. J.

Pipe, Transite

414. Two new illustrated booklets, "Transite Pressure Pipe" and "Transite Sewer Pipe" deal with methods of cutting costs of installation and maintenance of pipe lines and summarize advantages resulting from use of Transite pipes. Sent promptly by Johns-Manville Corp., 22 East 40th St., New York, N. Y.

Pipe Joints Sewer

415. How to make a better sewer pipe joint of cement—tight, minimizing root intrusion, better alignment of joint. Permits making joints in water-bearing trenches. General instructions issued by L. A. Weston, Adams, Mass.

Pipe, 2-inch Cast Iron

417. Generously illustrated booklet describes McWane 2-inch cast iron pipe and its manufacture in streamlined pipe shop. Write McWane Cast Iron Pipe Co., Birmingham 2, Ala.

Pipe Joint Compounds

418. The uses of Tegul-Mineralead for bell and spigot pipe and G-K Sewer joint compound are described in a 16-page illustrated booklet issued by Atlas Mineral Products Co., Mertztown, Pa. Includes useful tables for estimating quantities needed.

Pumps and Well Water Systems

420. Installation views and sectional scenes on Layne Vertical Centrifugal and Vertical Turbine Pumps fully illustrated and including useful engineering data section. Layne Shutter Screens for Gravel Wall Wells. Write for descriptive booklets. Advertising Dept., Layne & Bowler, Inc., Box 186, Hollywood Station, Memphis, Tenn.

Meter Setting and Testing

430. The most complete catalog we have seen on setting and testing equipment for water meters—exquisitely printed and illustrated 48-page booklet you should have a copy of. Ask Ford Meter Box Co., Wabash, Ind.

Screens

434. Be assured of uninterrupted, constant automatic removal of screenings. Folder 1587 tells how. Gives some of the outstanding advantages of "Straightline Bar Screens" (Vertical and Inclined types). Link-Belt Co., 2045 W. Hunting Park Ave., Philadelphia, Pa.

Sludge Drying and Incineration

440. "Disposal of Municipal Refuse." Complete specifications and description including suggested form of proposal; form of guarantees; statements and approval sheet for comparing bids with diagramatic outline of various plant designs. 48 pages. Address: Morse Boulger Destructor Co., 216-P East 45th St., New York 17, N. Y.

442. Recuperator tubes made from Silicon Carbide and "Fireclay" Corebusters for maximum efficiency are described and illustrated in bulletin No. 11 issued by Fitch Recuperator Co., Plainfield National Bank Bldg., Plainfield, N. J.

443. Nichols Herreshoff incinerator for complete disposal of sewage solids and industrial wastes—a new booklet illustrates and explains how this Nichols incinerator works. Pictures recent installations. Write Nichols Engineering and Research Corp., 60 Wall Tower, New York, N. Y.

Softening

444. This folder explains the process of Zeolite water softening and describes and illustrates the full line of equipment for that purpose made by the Graver Tank & Mfg. Co., 332 So. Michigan Ave., Chicago, Ill. Includes flow charts, tables and other valuable data. Write for a copy of this instructive folder.

445. Water Softening. The use of the Spaulding Precipitator to obtain maximum efficiency and economy in water softening is described in a technical booklet. Permutit Co., 330 W. 42nd St., New York 18, N. Y.

Sprinkling Filters

447. Design data on sprinkling filters of Separate Nozzle Field and Common Nozzle Field design as well as complete data on single and twin dosing tanks, and the various siphons used in them, for apportioning sewage to nozzles. Many time-saving charts and tables. Write Pacific Flush Tank Co., 4241 Ravenswood Ave., Chicago 13, Ill.

Swimming Pools

448. Data and complete information on swimming pool filters and recirculation plants; also on water filters and filtration equipment. For data prices, plans, etc., write Roberts Filter Mfg. Co., 640 Columbia Ave., Darby, Pa.

Taste and Odor Control

449. "Taste and Odor Control in Water Purification" is an excellent 92-page, illustrated booklet covering sources of taste and odor pollution in water supplies and outlining the various methods of treatment now in use. Every water works department should have a copy. Write Industrial Chemical Sales Div., 230 Park Ave., New York, N. Y.

450. Technical pub. No. 207 issued by Wallace & Tiernan Co., Inc., Newark 1, N. J., describes in detail taste and odor control of water with BREAK-POINT Chlorination, a method of discovering the point at which many causes of taste may be removed by chlorination with little or no increase in residual chlorine. Sent free to any operator requesting it.

453. "Safe Sanitation for a Nation," an interesting booklet containing thumbnail descriptions of the different pieces of P.F.T. equipment for sewage treatment. Includes photos of various installations and complete list of literature available from this company. Write Pacific Flush Tank Co., 4241 Ravenswood Ave., Chicago 13, Ill.

454. A full line of equipment for sewage disposal including clarifiers, chemical treatment plants, rotary distributors, gas holders and many other pieces of equipment are described in a new bulletin just issued by Graver Tank & Mfg. Co., 332 So. Michigan Ave., Chicago, Ill.

455. New booklet (No. 1642 on Link-Belt Circuline Collectors for Settling Tanks contains excellent pictures; drawings of installations, sanitary engineering data and design details. Link-Belt Company, 2045 W. Hunting Park Ave., Philadelphia.

456. New 16-page illustrated catalog No. 1742 on Straightline Collectors for the efficient, continuous removal of sludge from rectangular tanks at sewerage and water plants. Contains layout drawings, installation pictures, and capacity tables. Address Link-Belt Co., 2045 West Hunting Park Ave., Philadelphia, Pa.

457. New illustrated folder (1942) on Straightline apparatus for the removal and washing of grit and detritus from rectangular grit chambers. Address: Link-Belt Co., 2045 W. Hunting Park Ave., Philadelphia, Pa.

458. "Sedimentation with Dorr Clarifiers" is a complete 36-page illustrated catalog with useful design data. Ask The Dorr Company, 570 Lexington Ave., New York 22, N. Y.

459. A combination mechanical clarifier and mechanical digester, The Dorr Clarigester, is explained and illustrated in a bulletin issued by The Dorr Company, 570 Lexington Ave., New York 22, N. Y.

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462. Dorrco Monorake for existing rectangular sedimentation tanks, open or closed, is described and illustrated in a new catalog sent on request. The Dorr Co., 570 Lexington Ave., New York 22, N. Y.

465. Grit Washers and Collectors, by Jeffrey are built in three types: scraper, V-bucklet and combination. For full details ask for Jeffrey Catalog No. 703-A. Jeffrey Mfg. Co., 948-99 No. Fourth St., Columbus, Ohio.

466. Flocculation with Floctrols. For details on controlled flocculation, tapered mixing, practical elimination of short circuiting, rapid settling of properly flocculated solds write for Catalog No. 703-A. Jeffrey Mfg. Co., 948-99 No. Fourth St., Columbus, Ohio.

Underdrains, Trickling Filter

468. Illustrated bulletin describes the Natco Unifilter block of glazed, hard burned clay for underdraining filter beds. Write National Fireproofing Corp., Pittsburgh, Pa., for free copy.

Valves (See Gates, Air Release, etc.)

Water Treatment

470. If you have a water conditioning problem of any kind, write Graver Tank & Mfg. Co., 332 So. Michigan Ave., Chicago, Ill., who manufacture all types of conditioning equipment and will be pleased to make recommendations.

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500. Data on anti-freeze outdoor drinking fountains, hydrants, street washers, etc., will be sent promptly on request to Murdock Mfg. & Supply Co., 426 Plum St., Cincinnati, Ohio.

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2—Method and Units of Measurement
3—Sewage Characteristics and Composition
4—Tests and How to Make Them
5—Operating Grit Chambers and Coarse Screens
6—Sedimentation Tanks
7—Activated Sludge
8—Imhoff Tanks
9—Trickling Filter Operation
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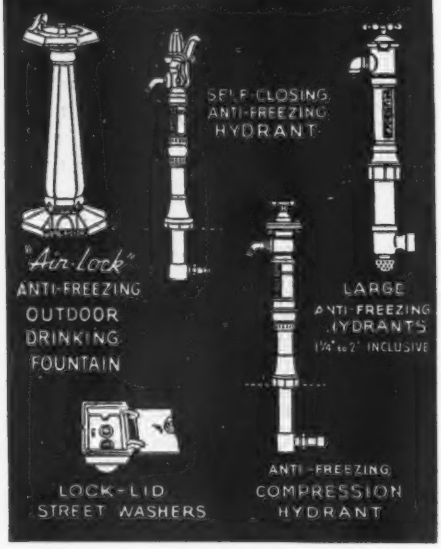
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Sewage Works Meeting

Final Program for the Fourth Annual Conference of Federation of Sewage Works Associations

The meeting to be held at the Hotel Sherman, Chicago, October 21-23, will have a wartime character, from the exhibits of equipment sponsored by the Water and Sewage Works Mfgrs. Association, to the subjects listed on the technical program. The meeting is of such importance to the national health and welfare that it is hoped the attendance will exceed that of any previous national sewage works gathering.

The Program Committee, F. W. Gilcreas, chairman, announces that one complete day of the convention will be devoted to war subjects. A symposium on wartime problems will feature discussion on priorities by A. M. Rawn and personnel problems by Captain C. W. Klassen. Equipment maintenance problems will be discusssed.

The problems of post-war planning and post-war construction of sanitation works will be reviewed from the viewpoint of governmental, engineering, public health agencies and sanitary engineering equipment manufacturers.

A program in detail follows:

THURSDAY MORNING

9:00 — Registration; Inspection of Exhibits. 10:30—Federation meeting opens; Greetings from city officials. 11:00 — Business meeting. 12:00 — Luncheon. Speaker: Gordon M. Fair—Subject: The outlook for sewage treatment in the Latin-American Republics.

THURSDAY AFTERNOON

1:30—High Rate Biological Sewage Treatment—Samuel A. Greeley. 2:00—Discussion: Captain R. M. Dixon, Frank A. Marston. 2:30—Industrial Wastes and the War Emergency—F. W. Mohlman. 3:00—Discussion: LeRoy W. Van Kleeck. 3:30—Grease Removal at Army Sewage Treatment Plants—Major Rolf Eliassen. 4:00—Discussion: Harry W. Gehm. 4:30—Relation of Sewage Treatment to the Transmission of Virus Diseases—Dr. Kenneth F. Maxcy. 5:30—Meeting of Central States Association.

FRIDAY MORNING
"SYMPOSIUM ON WAR TIME PROBLEMS"

9:00 — Priorities — A. M. Rawn. 9:30 — Discussion. 10:30 — Personnel Problems—Captain C. W. Klassen. 11:00—Discussion: William M. Wallace. 11:30 — Maintenance Problems. 12:00—Discussion. 12:30—Luncheon.

FRIDAY AFTERNOON

1:30 — Operating Problems — William W. Mathews. 2:00—Discussion. 2:30—Post-War Problems: Morris M. Cohn, C. A. Emerson, A. E. Berry, W. B. Marshall.

SATURDAY MORNING

8:00—Breakfast—Operators' Wartime Forum of 1943. Leader—John C. Mackin. 9:00—Meeting of Board of Control.

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ADVERTISERS

IN THIS ISSUE

Albright & Friel, Inc. 59
Alvord Burdick & Howson 59
Anthracite Equipment Corp. 58
Armco Drainage Products Assn. 43
Austin-Western Road Mach. Co. 69

Baker, Jr., Michael 59
Barrett Div. 35
Black & Veatch 59
Buck, Seifert & Jost 59
Builders-Providence, Inc. 25

Cafe Monaco 52
Caird, James M. 59
Calcium Chloride Assn. 3
Cast Iron Pipe Research Assn. .. 36 & 37
C. H. & E. Manufacturing Co. 49
Chem. Feeds, Inc. 46
Cleveland Rock Drill Co. 4
Cuprinol, Inc. 49

Dow, A. W., Inc. 59

Flexible Sewer Rod Equipment Co.... 53
Frink Mfr., Carl H. 45

Galion Iron Works & Mfg. Co. 33
Gannett, Eastman & Fleming, Inc.... 59
Goff, William A. 59
Goodwin Engrg. Co., J. W. 59
Gorman-Rupp Company 48
Graver Tank & Mfg. Co. 10
Greeley & Hansen 59
Green Co., Howard R. 59
Griffin Wellpoint Corp. 68

Highway, Street and Airport Manual.. 49
Homelite Corp. 61
Hotel Keystone 64

International Salt Co. 44

Jaeger Machine Co. 45
Johns-Manville Corp. ..... 8 & 9

Lakeside Engineering Corp. 52
Layne & Bowler, Inc. 29
Littleford Bros., Inc. 47
Lubriplate Div., Fiske Bros. Refining Co. 35

Metcalf & Eddy 58
M & H Valve Fittings Co. 57
Morse Boulger Destructor Company.. 54
Murdock Mfg. & Supply Co. 68

National Fireproofing Corp. 54
Norton Company 31

Pacific Flush Tank Co. 54
Park Hotel 48
Pirnie, Malcolm 59
Pittsburgh Equitable Meter Co. ..... 19 & 20
Proportioneers, Inc. ..... Front Cover

Robert & Co., Inc. 59
Roberts Filter Manufacturing Co. 58
Russell & Axon Cons. Engrs., Inc. 59

Simplex Valve & Meter Co. 6
Sirrine & Co., J. E. 59
Snell, Inc., Foster D. 59
Solvay Sales Corp. 56
South Bend Foundry Co. 54
Stewart, W. H. 62

Taylor Co., W. A. 58
Timber Engineering Co., Inc. 27

U. S. Pipe & Foundry Co. 51
U. S. Treasury Dept. 41

Wallace & Tiernan Co., Inc. ..... Back Cover
Ward LaFrance Truck Div. 2
Wood Co., R. D. 63